FM1 VFO 8MC with freq shift 3/12/74

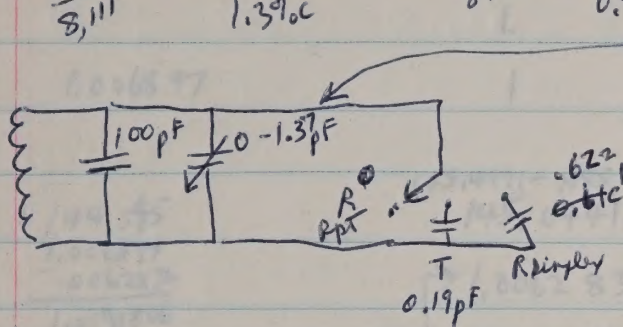
7

VFO — Rec error is 5kc on simplex receive at dial settings 146, +147MC
error tolerable since IF filter is abt 30 kc wide + deviation only ±5kc

8.13888

Trims 8.1111 - 8.1666 lower 2.5kc for simplex Rec, Rec is 8 kc for repeater recv

lower 55.5/8,111 add 1.39%c — 25/8138 add 0.61%c — 8/8138 subtract 0.199%c



.622 / 0.61c

Geo mean 146.499

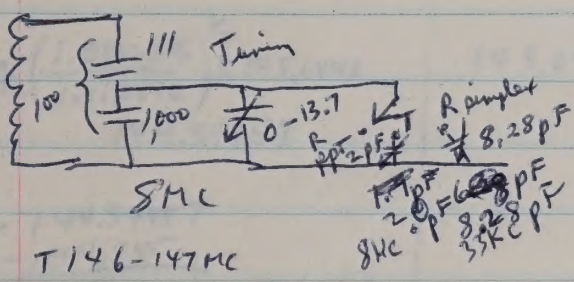
147/146 146 147

$\left(1+\frac{.455}{146.499}\right)^2 - 1 = .0062$ Δc

.04 .009 .001

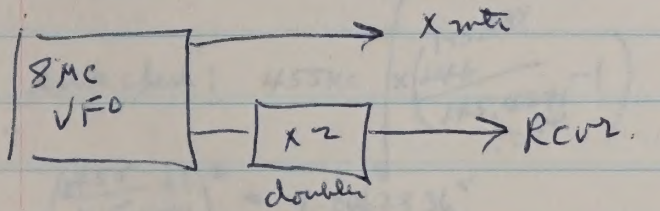
$\left(\frac{147}{146}\right)^2 - 1 = 0.0137$

8.1666 MC
8.1388
+ 8.111

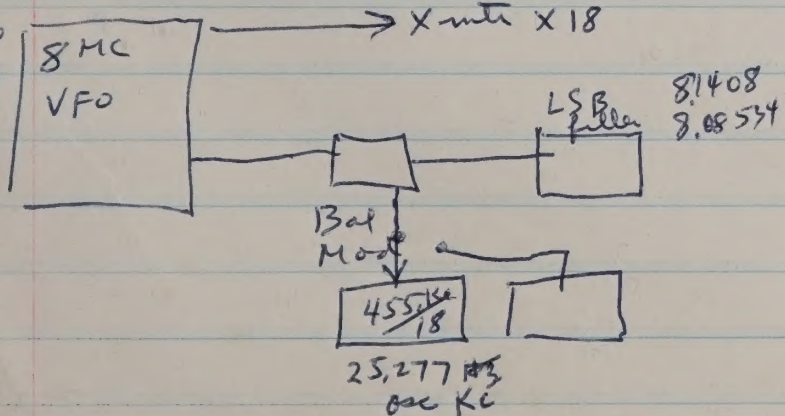


T 146 - 147 MC

1/147 ÷ 1/146



8.1666
8.1111



	freq T 145.	geo mean freq 145.4991	146.
~~Cap~~		1.	~~1.006897 = (146/145.4991)²~~
Cap	1.006897	1	0.993525

145.4991 − .455

145.0441 ref

	144.545		145.545
Cap	1.006897	1.0062836	~~1.006897~~ + 0.0062836 = 1.013806
	.0062836		.9931525 = .9994361
	1.0131806		

freq $\left(\frac{1.0062836}{1.0131806}\right)^{1/2} \times 145.0441$

144.54957

$\left(\frac{1.0062836}{.9994361}\right)^{\frac{1}{2}} \times 145.0441 = 145.54012$

error 144.54957 − 144.545 = .00457 kc

4.57 kc too high receive

145.545 − 145.54012 = .00488

4.8 kc too low receive

error check: $455\text{kc} \times \left(\frac{145.545}{146} - 1\right)$ (145.4991, .0441)

$\left(\frac{.455}{145.0441} + 1\right)^2 = 1.0062836$ ✓

VFO FM1

146 - 147 Mc

146 ÷ 18 = 8.11111 Mc 147 ÷ 18 = 8.166666 Mc

VFO freq: 8.1111 - 8.16666 Range 0.055555 Mc

146.52 - .455/9 = 16.22944 ÷ 2 = 8.114722 Rec
= 8.140000 Xmit

Δ = 0.025278 Mc shift down from Xmit = .455/18

146.52 ÷ 18

146.52

8 × XTAL - 129.8355

IF 16.6844

XTAL - 16.22944 = 2 × 8.114722

IF 0.455 Mc

~~For repeater~~: 147 Mc send 8.166666 rec 8.1413888 147.6 rec 8.1747222

146 Mc 8.111111 8.0858333 146 rec 8.1191666

Xmit range .055555 .055555 Rec range simplex .055555 rec range repeater

shift for repeater = 0.0080556 up for receive (147T)

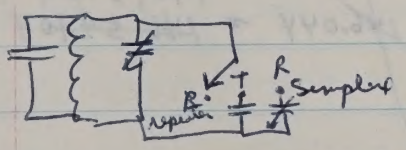
- 0.0080556 up for rec (146T)

diff in shift for 147 Mc(T) ~~.000000~~

Conclusion: For receive simplex shift down 25.277 Kc down

For receive repeater (600 Kc rec) 8.055 Kc up

33.333 Kc (600 Kc/18)



8.1111 - 8.16666 VFO range = 0.05555 / 8.13888 = .0068258 ~~Ag cut~~ = 0.0826 recip = freq range ratio = 1.0068

Capacitor ~~range~~ ratio =

100pF To 102pF. f ratio $= \sqrt{C_2/C_1} = \sqrt{1.02} = 101$

$\left(\frac{.455}{146.599}+1\right)^2 = 1.0062212$ C shift for rec

$\left(\frac{147}{146}\right)^2 = 1.0137455$ C range

at 147: $1. + .0062212 = 1.0062212$

at 146 $1.0137455 + .0062212 =$

F 146	146.499	147.
C_T 1.0137455 pF	1.0068512 pF	600 pF

F_{receptor} 145.545	146.044	146.545
C 1.0200289	1.0131344 pF	1.0062834 pF

$\Delta C = 0.0062834$ pF

$F = \sqrt{1.0200289} \times 146.044$

Rec capacity $146.044_R = (146.499/146.044)^2 \times 1.0068512 = 1.0131344$

ΔC rec $= 1.0131344 - 1.0068512 = 0.0062832$

Rec C 146.545 $= 1. + .0062832 = 1.0062832$

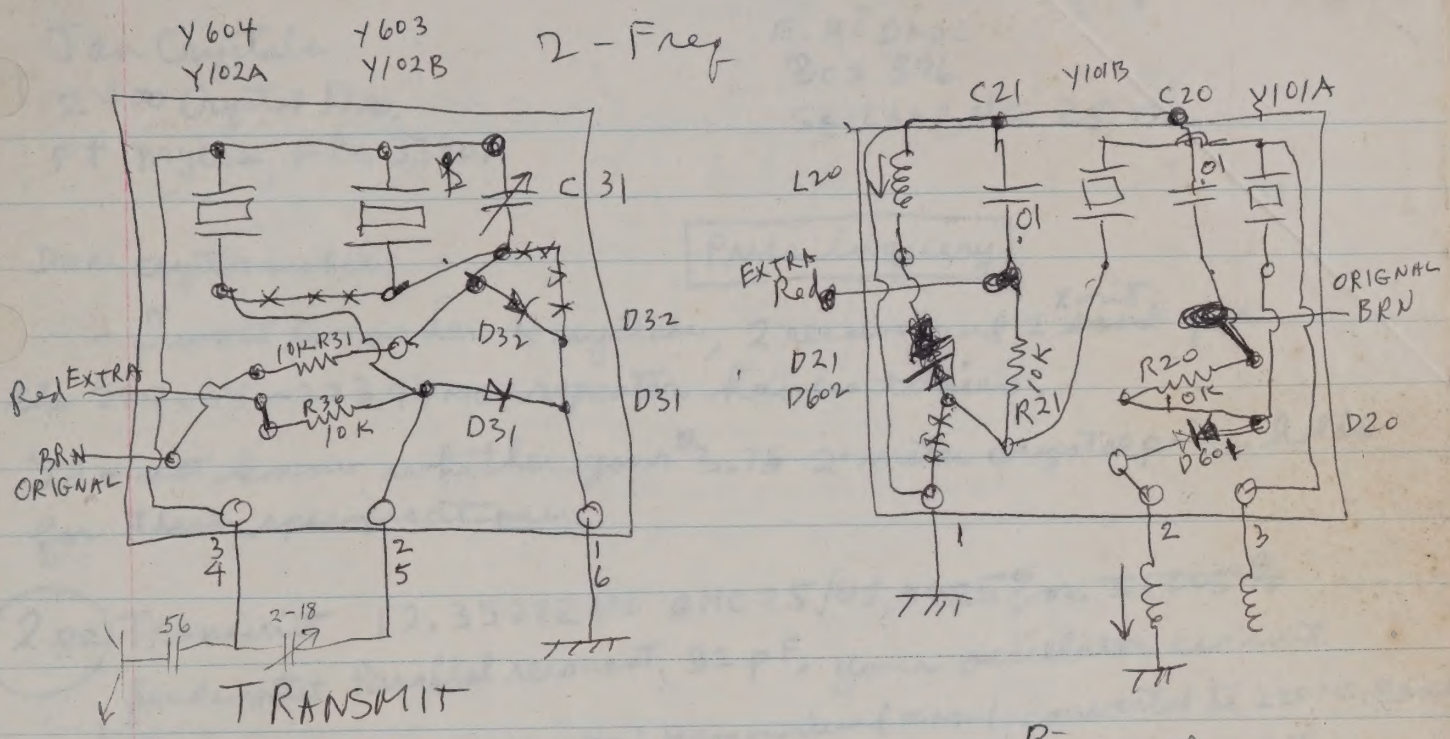
Rec f 146.545 $= \left(1.0131344 / 1.0062832\right)^{1/2} \times 146.044 = 146.54404$ (146.5403)

error f/C low

Rec C 145.545 $= 1.0131344 + 0.0062832 = 1.0194176$

Rec f 145.545 $= \left(1.0131344/1.0194176\right)^{1/2} \times 146.044 = 145.5932$

FM-1

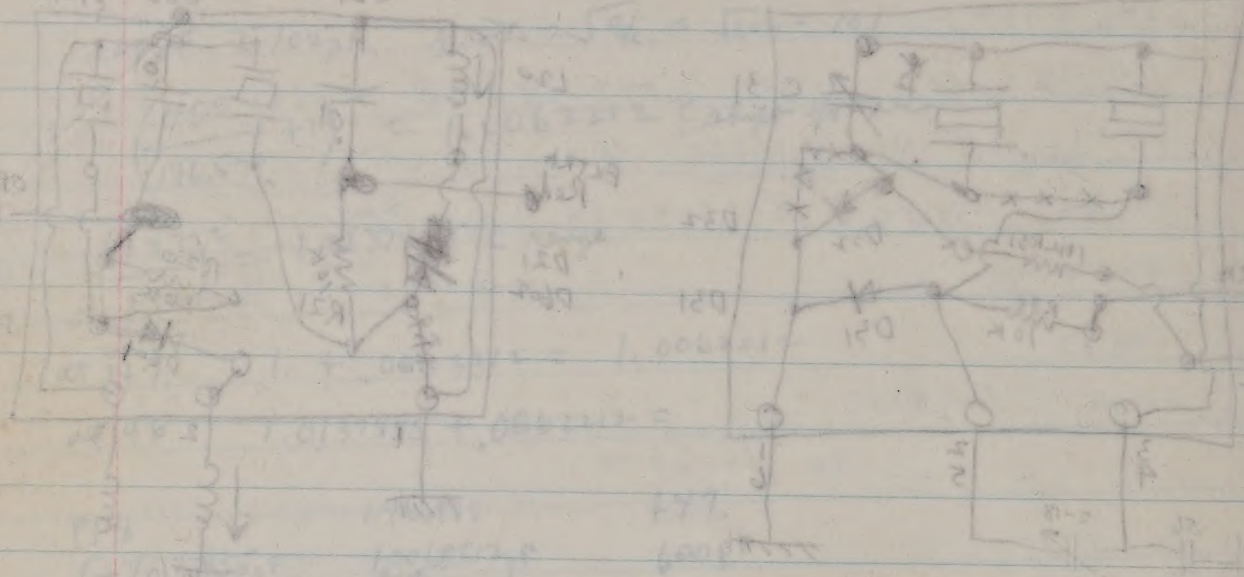


Separation 600Kc causes (66.Kc) change in IF freq.

146.76 − .455/9 = 16.256111 Mc crystal freq × 8 = 130.04888 − 146.76 = IF 16.71112

146.16 − .455/9 = 16.189444 × 8 = 129.51555 − 146.16 = 16.64445

.0666Mc


TRANSMIT

5-23-74

Jan Crystals
2400 Crystal Dr.
Ft Myers, Fla 33901

E. MC DADE
Box 396
SKYLAND, N.C. 28,776

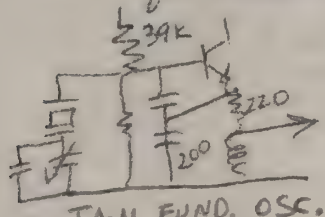
Dear crystal maker:

Price inquiry.

I want to order 4 crystals, 2 receive and 2 ~~send~~ xmit for the 222.34 – 223.94 MC repeater handie talkies.

I do not know whether your $3.75 2-meter crystal price holds for these specifications.

(2 ea) Transmit 12.35222 MC @ HC 25/U ±.0025% ~~or ±.005%~~
fundamental Parallel resonant, 32 pF, your oscillator circuit

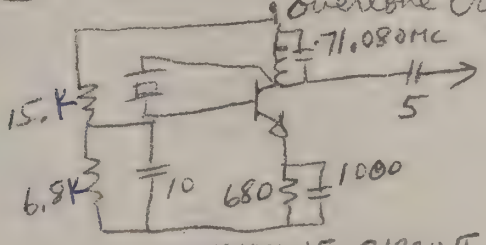


JAN FUND. OSC. CKT.

Transceiver: Hammarlund FM-1, converted to 220 MC, Band
Xtal freq. formula: 222.34/18 = 12.35222 T

$5.00?

(2 ea) Receive 71.080 MC HC 25/U ± .0025% ~~or ±.005%~~ load not specified, your oscillator circuit:
overtone crystal, series resonant



JAN OVERTONE CIRCUIT

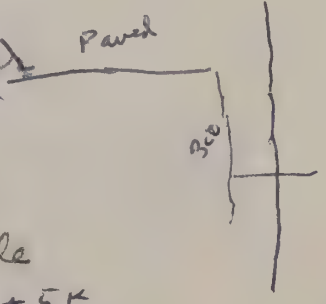
Transceiver: Hammarlund FM-1 converted
To 220 MC Band.
Xtal Freq. formula: (223.94 – 10.7) ÷ 3 = 71.080 MC

$5.25?

Please give price so I can order.

Thanks,

Everett McPade



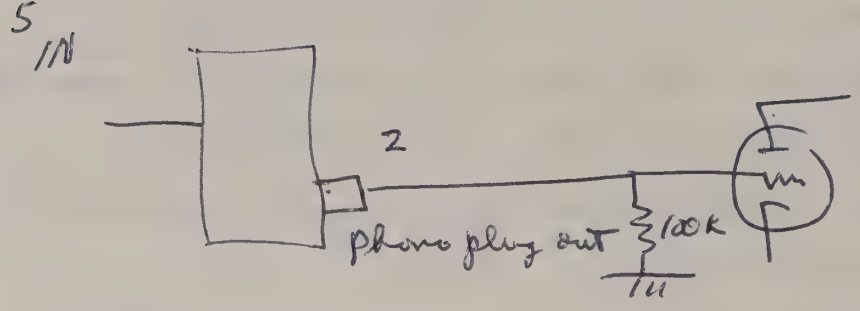
Jim Carrier WA4MKI
455 from old motors

Bill Falkner new crystals 455KC?
Miller 455KC "gain Block"
$2.60 for 10.7 (Dates?) Ceramic filters

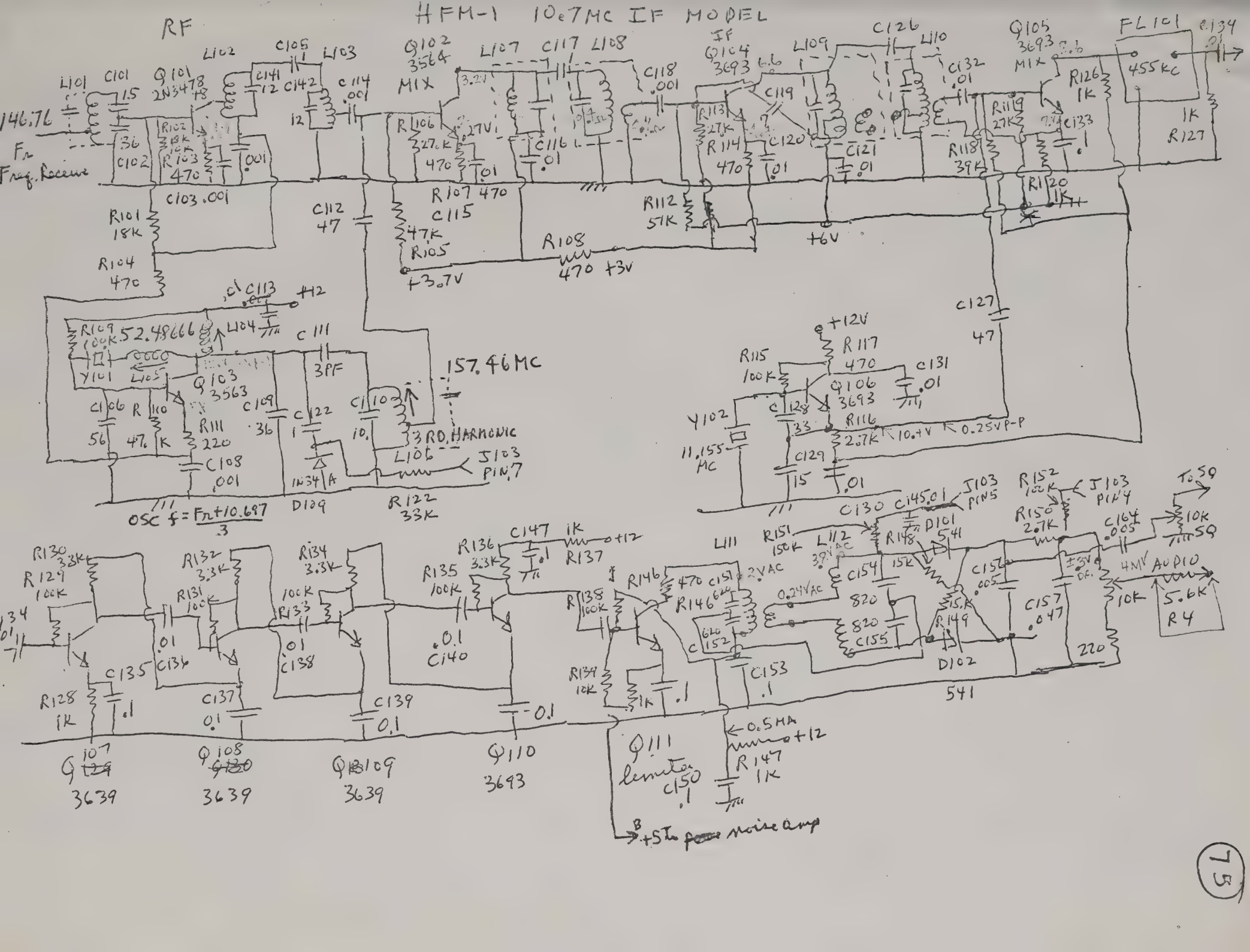
3x2x1 ±5K
{Permagain out of TV3, series} BOB Harmon
455 KC Motorola E.A.
RCA phone jack 6 ea 686-3527
About 1 lb. Avenue Monroe

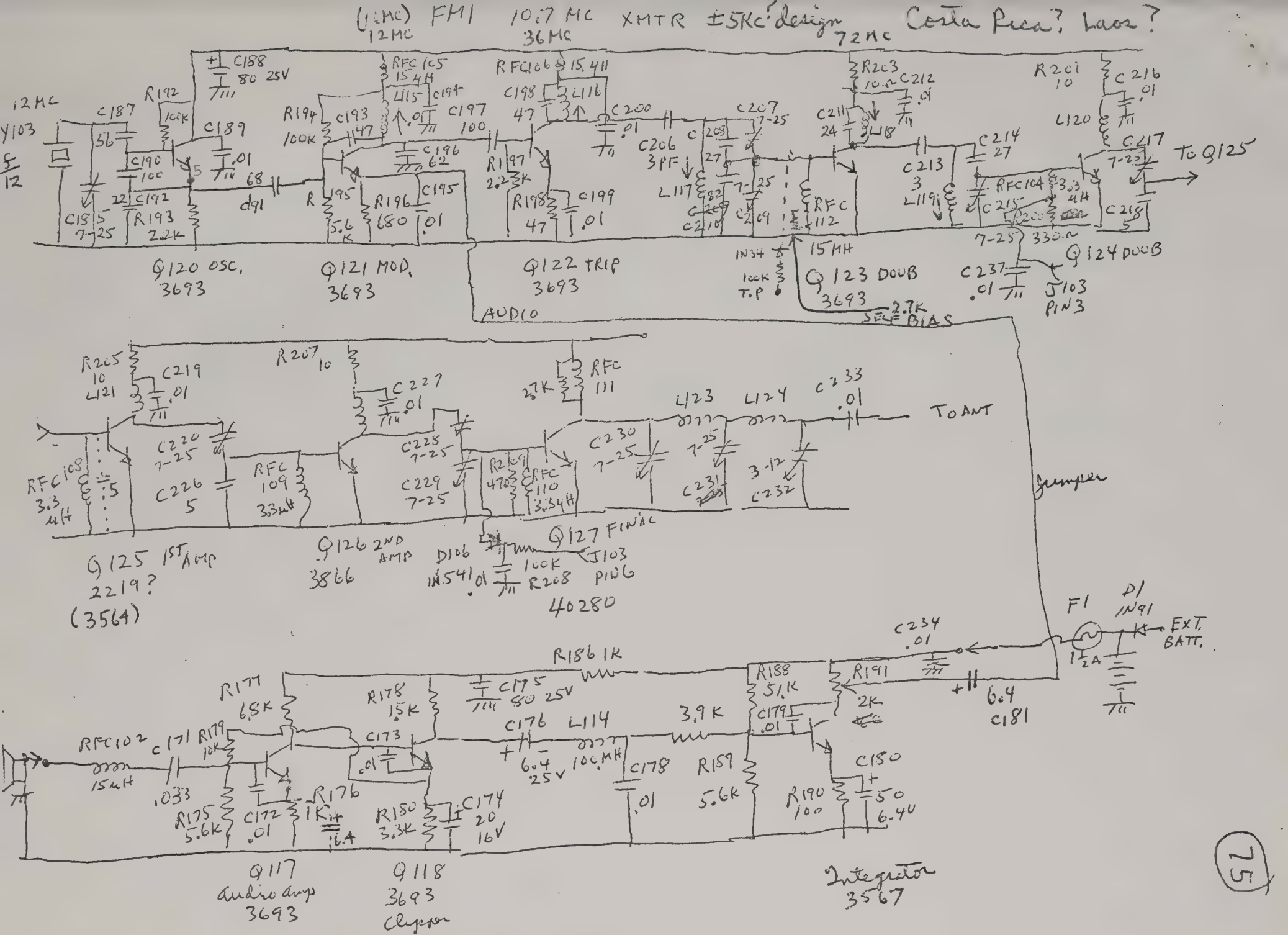
WB4ELA Bob Herman

Permaky TU 540W (W = ±15Kc
455Kc



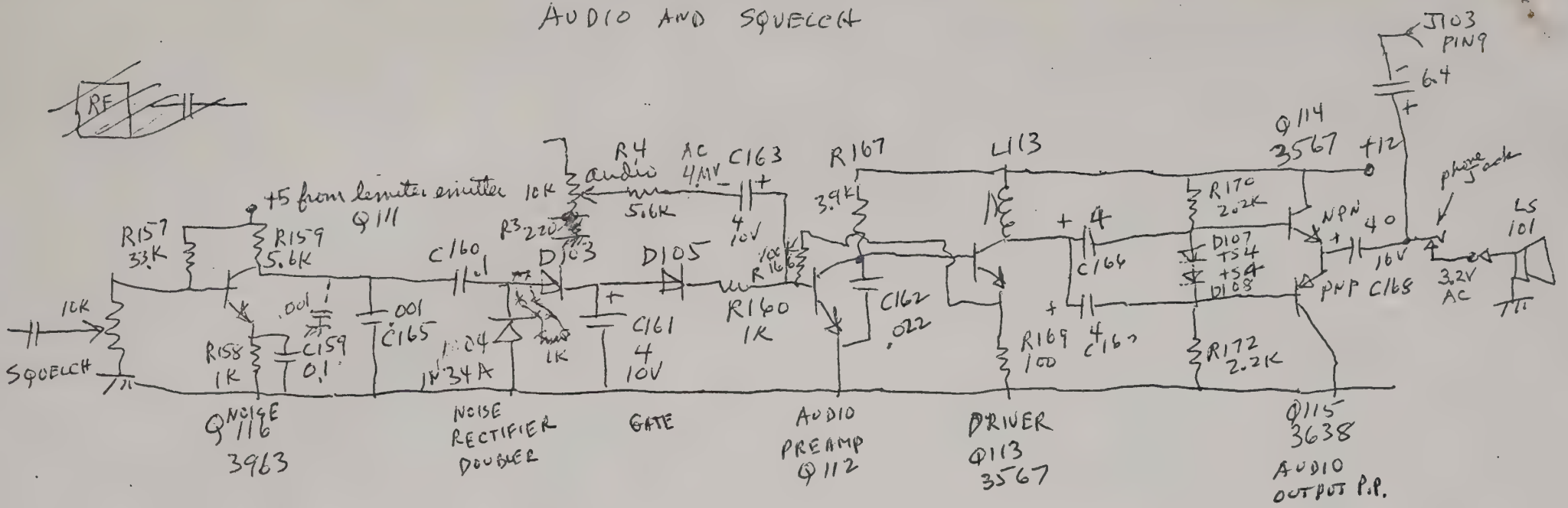
100 dB ± 32 Kc


HFM-1 10.7MC IF MODEL
RF
IF
146.76
Fr
Freq. Receive
Q101 2N3478
Q102 3564 MIX
Q104 3693
Q105 3693 MIX
FL101
455KC
Q103 3563
Q106 3693
Q107 3639
Q108 3639
Q109 3639
Q110 3693
Q111 limiter
157.46MC
3RD. HARMONIC
OSC f = Fr+10.697 / 3
11.155 MC
+12V
+6V
+3V
+3.7V
0.25V P-P
10.7V
0.24VAC
2VAC
39VAC
4MV AUDIO
5.6K R4
J103 PIN 7
J103 PIN 4
J103 PINS
To 59
0.5MA
+5V noise amp
D101 541
D102 541
D109 IN34A


(12MC) FM1 10.7 MC XMTR ±5KC design Costa Rica? Laos?
12MC
36MC
72MC
12MC
Y103
5
12
C187
56
C188
80 25V
R192
100K
C189
.01
C190
100
22
C192
R193
2.2K
C185
5
7-25
68
dg1
R194
100K
C193
47
RFC 105
15 uH
L115
C194
.01
C197
100
C196
62
R195
5.6K
R196
680
C195
.01
R197
2.2K
RFC106
15 uH
L116
C198
47
R198
47
C199
.01
C200
.01
C206
3PF
L117
C208
27
C207
7-25
C209
7-25
C210
RFC
112
R203
10
C212
.01
C211
24
L118
C214
27
C213
3
L119
RFC104
3.3 uH
C215
200
330Ω
C216
.01
L120
C217
7-25
C218
5
To Q125
Q120 OSC.
3693
Q121 MOD.
3693
Q122 TRIP
3693
AUDIO
IN34
100K
T.P
15 MH
Q123 DOUB
3693
2.7K
SEE BIAS
C237
.01
Q124 DOUB
J103
PIN 3
R205
10
L121
C219
.01
R207
10
C227
.01
27K
RFC
111
L123
L124
C233
.01
To ANT
C220
7-25
C226
5
RFC
109
33uH
C225
7-25
C229
7-25
R209
470
RFC
110
3.3uH
C230
7-25
7-25
C231
3-12
C232
RFC108
3.3 uH
Jumper
Q125 1ST AMP
2219?
(3564)
Q126 2ND AMP
3866
D106
IN541
.01
Q127 FINAL
100K
R208
J103
PIN 6
40280
F1
1½A
D1
IN91
EXT. BATT.
C234
.01
R186 1K
R188
51K
R191
2K
6.4
C181
R177
6.8K
R178
15K
C175
50 25V
C176
6.4
25V
L114
100MH
3.9K
C179
.01
C178
.01
R189
5.6K
C150
50
6.4V
R190
100
RFC102
15uH
C171
.033
R179
10K
C173
.01
R175
5.6K
C172
.01
R176
1K
6.4
R180
3.3K
C174
20
16V
Q117
audio amp
3693
Q118
3693
clipper
Integrator
3567
75

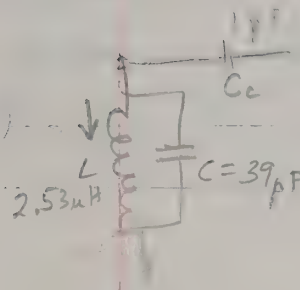
HFM1 10.7MC IF MODEL

AUDIO AND SQUELCH



FM-1 Use of 16 Mc IF Cans
to replace 10.7 Mc IF Cans

$f = \frac{1}{2\pi\sqrt{LC}}$ $\sqrt{L} = \frac{1}{2\pi f \sqrt{C}}$ $\sqrt{C} = \frac{1}{2\pi f \sqrt{L}}$



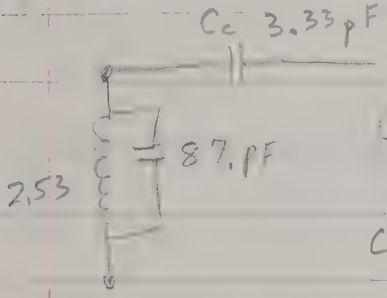
$X_L = 2\pi f L = 254\ \Omega$

① $L = \left(\frac{0.159}{f\sqrt{C}}\right)^2$ $X_C = \frac{1}{2\pi f C} = 255\ \Omega$

$39.10^{-12}\ \sqrt{\ } \times 16\times10^{6} = \frac{1}{x} \times 0.159 = x^2$ 25.3×10^{-6}

$f = 16$ Mc $BW = \frac{16}{39} = 410$ Kc for 1 coil

$Q = 39$



$f = 10.7$

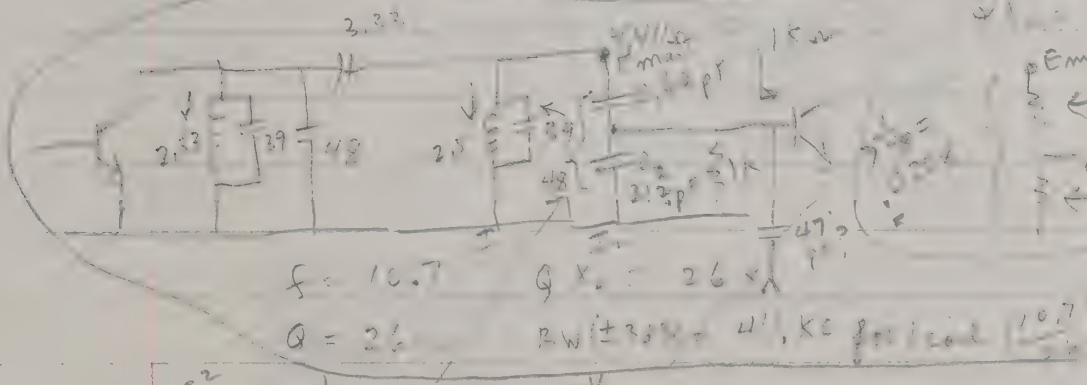
$Q = \frac{X_L}{R} = 0.668$ of Q at 16 Mc

$C_c = \frac{1}{39} \times 87 \times \frac{1}{0.668} = 3.33$ pF

$Q = 39 \times \frac{10.7}{16} = 26$

$X_L = 2\pi f L = 170\ \Omega$

$26 \times 170 = 4,411$



$f = 10.7$ $Q \times_0 = 26 \times$

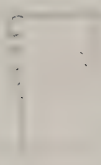
$Q = 26$ $BW \pm 3\% = 41$ Kc for 1 coil $\left(\frac{10.7}{26}\right)$

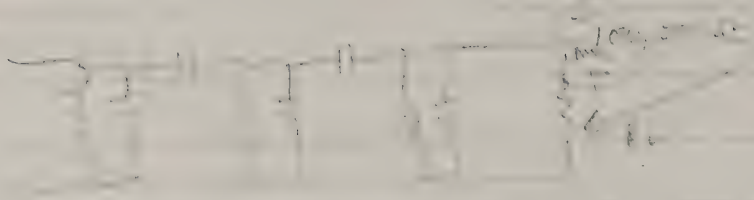
$P = \frac{E^2}{R} = \frac{1}{4,411} > 2.26 \times 10^{-4}$

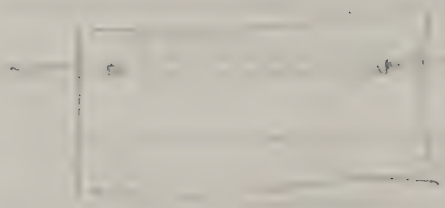
$I_2 = \frac{48}{87}$

C_1 series $C_2 = 48$ pF $C_2 = .226\ (C$

Note: due to stray C, capacitors will be > 48 pF, > 3.33 $\{> 62 - 2.2\}$







Ref QST 12/72

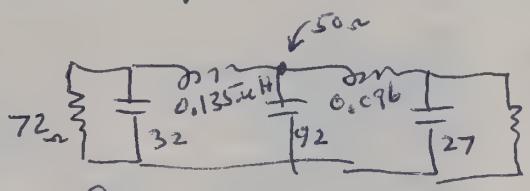
FM1 π networks

146 Mc for 1W out and 1/2W out

2-8-74

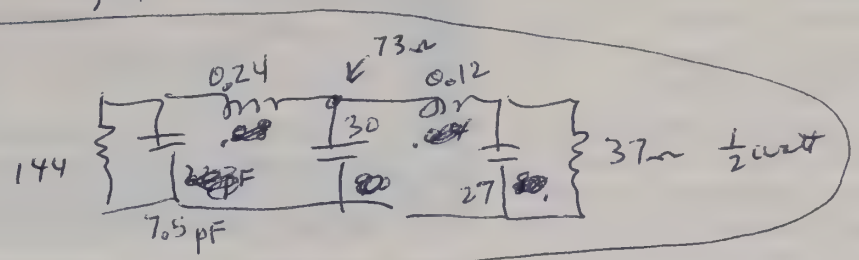
Q=1, Q=3

Q=1 1 watt out B+ 12V

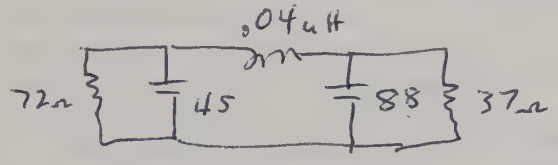


Q=1

Q=1 1/2 W out B+ 12.V.

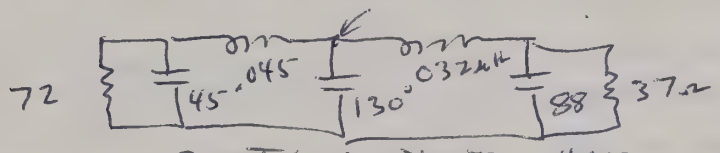


Q = 3



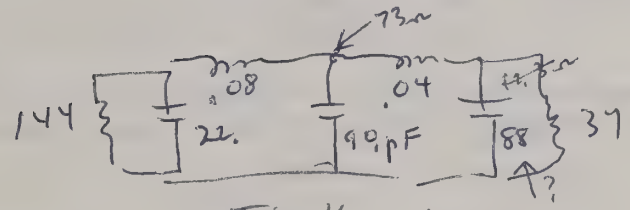
1 section 1 watt out 146MC

Q=3



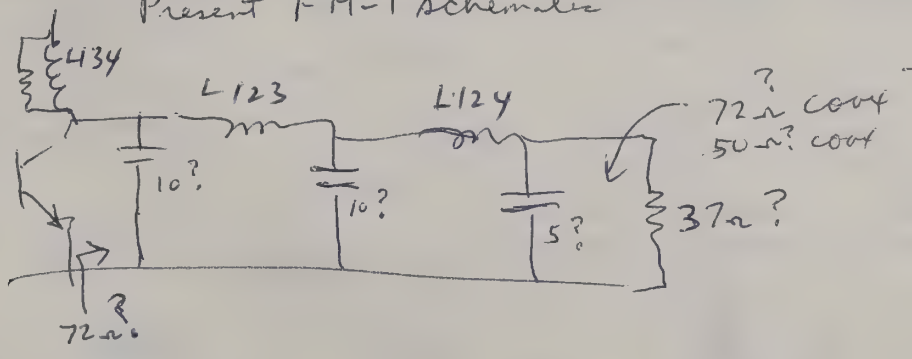
2 section 1 watt out 146MC

Q=3



2 section 1/2 watt

Present FM-1 schematic



Mar 14 74

Division of Bob Whan
& Son Electronics, Inc.
2400 Crystal Drive
Ft. Myers, Florida
33901
ALL PHONES
(813) 936-2397

JAN CRYSTALS

4-DAY WEEK

JAN CRYSTALS operates on a 4-Day Work Week, resulting in greater efficiency and reduced cost. (Monday thru Thursday). Our aim is constant improvement at minimum cost for our customers.

Since 1965, JAN CRYSTALS has become one of the country's outstanding QUARTZ CRYSTAL manufacturers.

Thousands of crystals are shipped each week to hundreds of satisfied customers throughout the U.S. and the entire world. JAN CRYSTALS are precisely manufactured to rigid specifications utilizing the latest developed electronic test and measuring equipment operated by trained personnel.

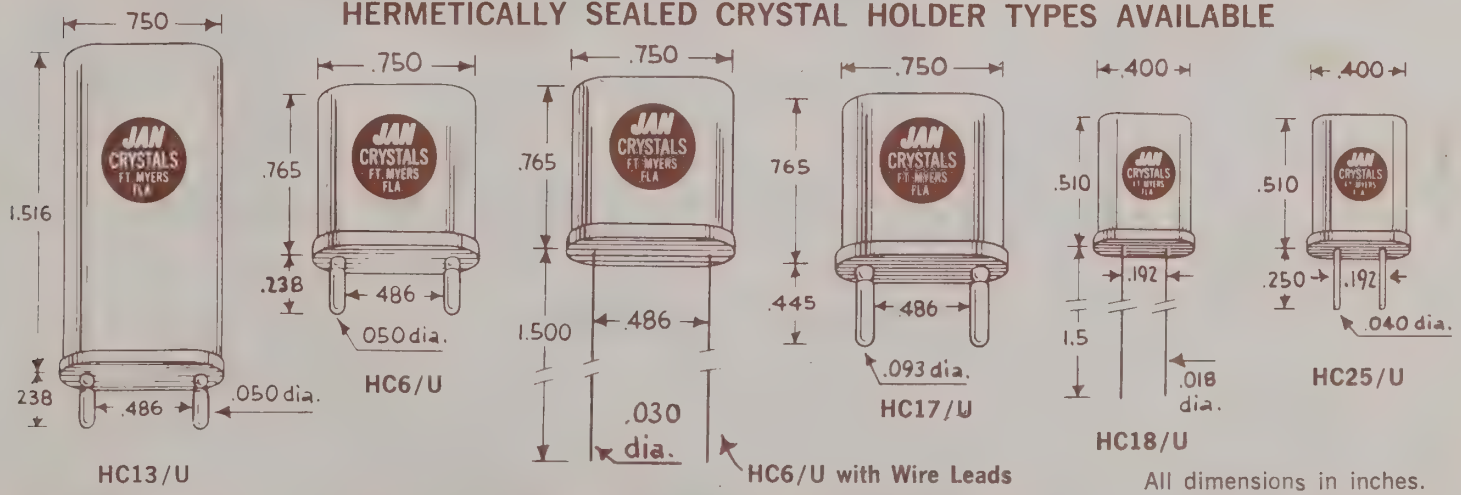
The crystal fabrication is conducted in a totally temperature, humidity and dust controlled area.

ALL JAN CRYSTALS are fully inspected in our QUALITY CONTROL DEPARTMENT prior to shipment to insure you of receiving the finest product possible.

JAN CRYSTALS unconditionally guarantees its crystals, as long as the crystals are used in the proper equipment and oscillator load and are not abused by high drive levels which will result in abrupt frequency changes.

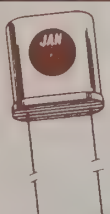
Our ENGINEERING STAFF, with many years of experience, gladly responds to all your varied crystal requirements and will assist you in your crystal oscillator design or prototype work. You can order with CONFIDENCE when ordering JAN CRYSTALS.

HERMETICALLY SEALED CRYSTAL HOLDER TYPES AVAILABLE

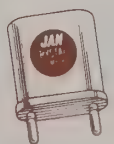


All dimensions in inches.

SPECIAL CRYSTALS IN STOCK



1.60 EA.
4 for 5.00
COLOR TV CRYSTAL
European Freq.
4433.618
HC6/U - Wire Leads



4.50 EACH
1000 KHz Freq.
Standard in
HC6/U Holder

4.50 EACH
100 KHz Freq.
Standard in
HC13/U Holder

5.10 EACH
1000 KHz
Crystal for BC221
In metal holder
with octal base,
.0001 tolerance,
for frequency
standard.

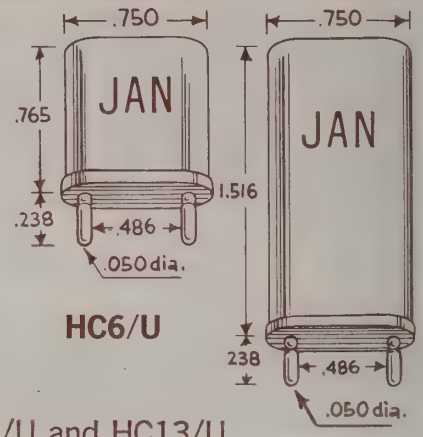
1.60 EA.
4 for 5.00
COLOR TV CRYSTAL
3579.545 KHz
Wire Leads

MADE TO ORDER PRECISION CRYSTALS

All crystals on this page are filled with dry-nitrogen gas and hermetically sealed to assure the greatest stability.

LOW FREQUENCY CRYSTALS - Frequency Range 16KHz to 1000 KHz.
Below 16 KHz on Special Request
16 KHz to 150 KHz — Holder type HC13/U
151 KHz to 1000 KHz — Holder type HC6/U

FREQUENCY	CALIBRATION TOL. ± .02%	CALIBRATION TOL. ± .01%
16 KHz to 25 KHz	$14.00 Ea.	$16.00 Ea.
26 KHz to 99 KHz	8.50	10.50
101 KHz to 200 KHz	7.50	9.50
201 KHz to 369 KHz	6.50	8.50
370 KHz to 540 KHz	4.75	6.75
541 KHz to 730 KHz	8.50	9.50
731 KHz to 1000 KHz	4.75	6.75



HC6/U and HC13/U also available in wire leads (.030" dia.)

Recommended Drive Level: 16 KHz — 80 KHz 1 m Watt (NT, 5°x, Elements)
80 KHz — 1000 KHz 2 m Watt (5°x, DT, CT, SL, Elements)

When ordering, specify the following Frequency; type of holder; tolerance at room temperature; series/parallel resonance; load capacity (standard load capacities are 20pF, 30pF, 32pF); oven or non-oven.

FUNDAMENTAL MODE CRYSTALS

Holder types available HC6/U, HC17/U, HC18/U, HC25/U and HC6/U with wire leads.

Frequency	Calibration Tol. ± .005%	Calibration Tol. ± .0025%	Calibration Tol. ± .001%	Oven ± .002% 75°C / 85°C
1001 KHz to 1999 KHz	$6.50 Ea.	$7.50 Ea.	$8.50 Ea.	$8.50 Ea.
2000 KHz to 2500 KHz	4.50	5.50	5.50	6.50
2501 KHz to 12000 KHz	3.00	4.00	5.00	5.00
12001 KHz to 18000 KHz	4.00	5.00	6.00	6.00
18001 KHz to 20000 KHz	5.00	6.00	7.00	7.00

Special Note: Frequencies below 5000 KHz are not available in the miniature holders HC18/U and HC25/U, only on special request.

OVERTONE CRYSTALS

Frequency Range 15 MHz to 105 MHz - Above 105 MHz on Special Request
Holder types available HC6/U, HC17/U, HC18/U, HC25/U and HC6/U with wire leads.

Frequency	Calibration Tol. ± .005%	Calibration Tol. ± .0025%	Calibration Tol. ± .001%	Oven ± .002% 75°C / 85°C
15 MHz to 52 MHz	$4.00 Ea.	$5.00 Ea.	$6.00 Ea.	$6.00 Ea.
53 MHz to 85 MHz	4.50	5.50	6.50	6.50
86 MHz to 105 MHz	5.00	6.00	7.00	7.00

Frequencies from 15 HMz to 52 HMz are third overtone, from 52 MHz up, 5th or 7th.
Frequency Range: 15 MHz — 25 MHz (third overtone) only available in HC6/U or HC17/U

When ordering, specify the following Frequency; type of holder; calibration tol. at room temperature; series/parallel resonance; load capacity (standard load capacities are 20pF, 30pF, 32pF); oven or non-oven.

HOW TO ORDER

Enclose check or money order for the full amount of your order or request C.O.D. Delivery.

Postage & Handling for Parcel Post	**add 15¢ per crystal**
First Class Mail & Packing	**add 20¢ per crystal**
Air Mail & Packing	**add 25¢ per crystal**
All orders outside the U.S.A. via Air Mail	**add 30¢ per crystal**

Orders placed within the State of Florida require 4% Sales Tax.

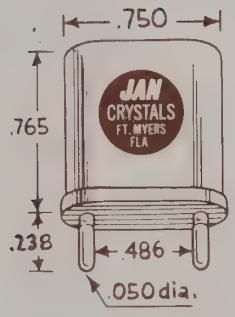
Make check or money order payable to:

JAN CRYSTALS, 2400 CRYSTAL DRIVE, FT. MYERS, FLA. 33901

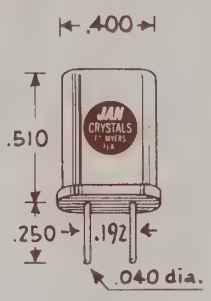
JAN CRYSTALS
2400 Crystal Dr.
Ft. Myers, Fla. 33901
All Phones (813) 936-2397

2-METER F.M. CRYSTALS 144-148 MHz

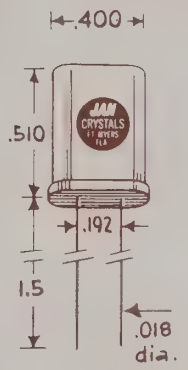
Transmit or Receive **Accuracy: ± .0025%**



HC6/U



HC25/U



HC18/U

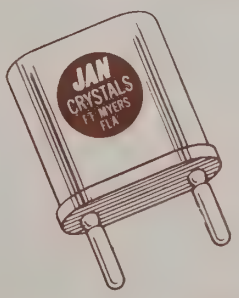
$3.75 EA.

***When higher tolerance is required such as ±.001%, add $1.00 to above price.**

Any of the above type holders when ordered for the VHF Amateur 2-Meter F.M. band (144-148 MHz) and used in most of the following transceivers: Regency, Heathkit, Tempo, Standard, Sonar, Genave, Yaesu . . . specify crystal type, frequency, make of equipment, model number and whether Transmit or Receive. For use in all other equipment, ask for prices on Amateur or Commercial crystals.

We maintain technical information on most popular Amateur 2-Meter F.M. Transceivers.

VHF and UHF MONITOR SCANNER CRYSTALS



VHF MARINE CRYSTALS

We manufacture closer tolerance crystals for Scanners and VHF marine equipment. Always specify manufacturer, make, model, operating frequency or channel. For basic pricing, see page two or on request.

Guaranteed Performance • Higher Quality • Guaranteed To Satisfy

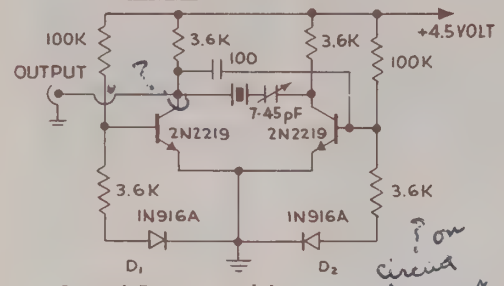
ASK FOR OUR ORDER FORM WITH HELPFUL INFORMATION

WE AT JAN CRYSTALS ARE KEEPING A LARGE AND ACCURATE REFERENCE FILE ON CRYSTAL SPECIFICATIONS FOR MANY COMMUNICATIONS EQUIPMENT ON THE MARKET: TWO WAY RADIO, SCANNERS, MONITORS, C.B. TRANSCEIVERS, ETC.
TO AVOID DISCREPANCIES WE PREFER THAT YOU SUPPLY US WITH AS MUCH PERTINENT DATA AS POSSIBLE, SO THAT WE CAN ASSURE OUR CUSTOMERS OF CORRECT CRYSTAL CALCULATION AND CORRELATION.

TYPICAL TRANSISTORIZED OSCILLATOR CIRCUITS

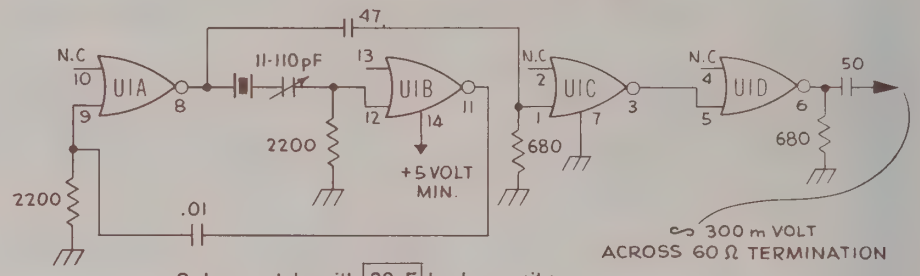
100 KHz STANDARD OSCILLATOR 1

32pF Load Capacity



D1 and D2 are used to stabilize the output.

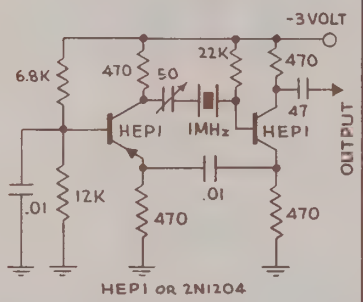
100 KHz - 3MHz TTL OSCILLATOR 2



Order crystals with 32pF load capacity

N-7400 or Equivalent

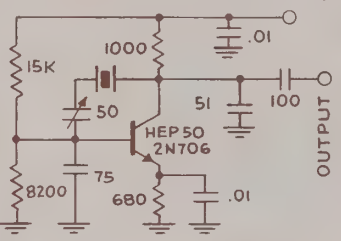
1 MHz STANDARD OSCILLATOR 3



When ordering, specify 32pF load capacity

2 MHz - 20 MHz FREQ. RANGE CRYSTAL OSCILLATOR 4

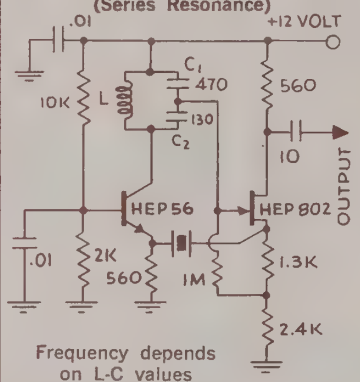
Specify 32pF load capacity



This oscillator is a modified Pierce circuit that provides good output and high stability. For proper operation the output should work into 600 ohms or more. If less than 600 ohms, use a Fet-Bipolar buffer circuit.

TYPICAL BUTLER OSCILLATOR — 20 - 100 MHz 5

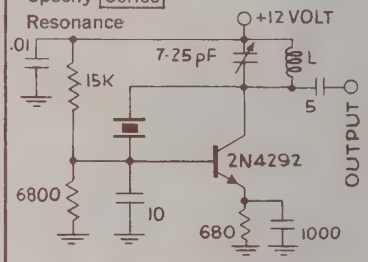
(Series Resonance)



Frequency depends on L-C values

20 - 100 MHz FREQ. RANGE CRYSTAL OSCILLATOR 6

Specify Series Resonance

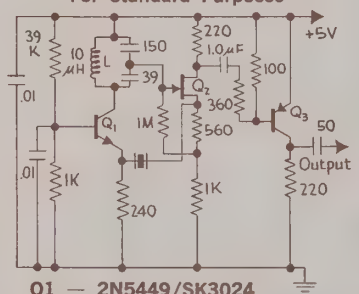


Note: The oscillator is designed for overtone crystals in the range from 20 - 100 MHz 3rd and 5th mode. The frequency of operation is determined by the tuned circuit.

L is 20 - 35 MHz 2.4 μH (Miller 4606)
35 - 60 MHz .68 μH (Miller 4590)
60 - 100 MHz .22 μH (Miller 4584)

10 MHz SERIES RESONANCE OSCILLATOR 7

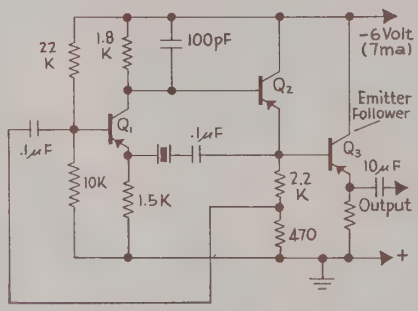
For Standard Purposes



Q1 = 2N5449/SK3024
Q2 = 2N4416/SK3112
Q3 = 2N5447/SK3114
L = 10μH or
J. W. Miller #4309

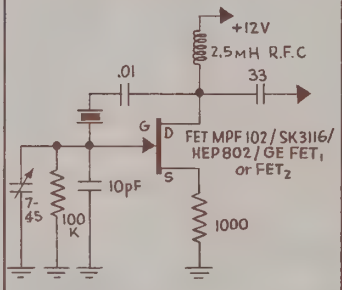
By changing L/C circuit this oscillator can be used for other frequencies.

60-180 KHz SERIES RESONANCE 8



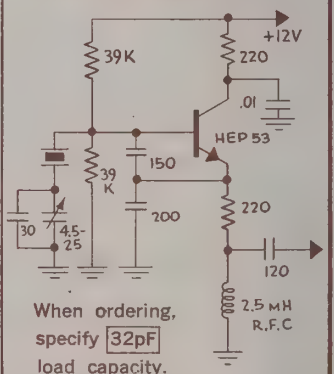
Q1 = Q2 = Q3 = HEP-3, SK3005, TR-17, 2N3783 ETC

FUNDAMENTAL 2-20 MHz FET OSCILLATOR 9



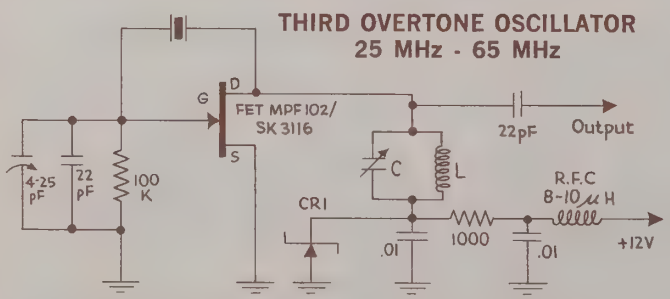
When ordering, specify 32pF load capacity.

FUNDAMENTAL 2-20 MHz OSCILLATOR 10



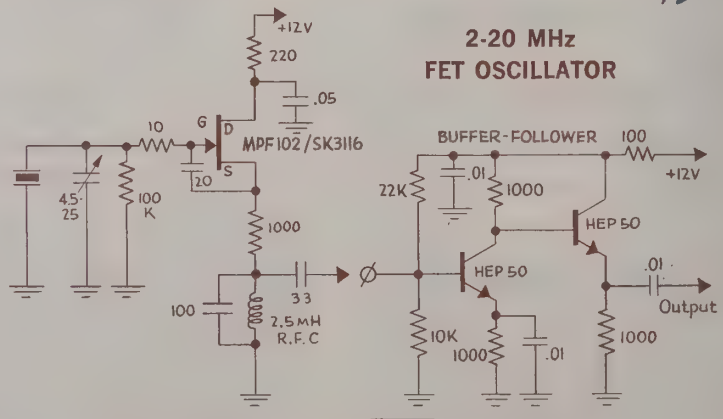
When ordering, specify 32pF load capacity.

THIRD OVERTONE OSCILLATOR 25 MHz - 65 MHz 11



When ordering, specify 15pF load capacity.
Frequency range depends on L/C circuit
ZENER CR1 = HEP-104 or equivalent

2-20 MHz FET OSCILLATOR 12



When ordering, specify 32pF load capacity.

AMATEUR BAND CRYSTALS

The still unbeatable Pressure Mount FT-243

$1.50 EACH

4 FOR $5.00

±.005% Tolerance
32pF Load Capacity

40-meter	general	7025 to 7300	fund.	7025-7300
40-meter	novice	7100 to 7150	fund.	7151-7199
20-meter	general	14.025 to 14.350	double	7015-7175
20-meter	general	14.025 to 14.350	triple	4675-4780
15-meter	general	21.025 to 21.450	triple	7008-7150
15-meter	novice	21.100 to 21.250	triple	7034-7082
10-meter	general	28.000 to 29.700	X4	7000-7425
6-meter	gen. & tech.	50.100 to 54.000	X6	8350-9000
2-meter	general	144 MHz to 148 MHz	X18	8001-8221
2-meter	novice	145 MHz to 147 MHz	X18	8056-8166
2-meter	tech.	145 MHz to 147 MHz	X18	8056-8166

We will make any frequency in the amateur bands listed above + or − 1 KHz, $1.50 each or 4 for $5.00. For exact frequencies, ±.005% tol., $2.00 each. Order by frequency and type FT-243 holder. Listed in KHz.
All crystals listed are fully guaranteed. When ordering amateur band crystals, do not order frequencies too close to the edge of the band.

PRESSURE TYPE CRYSTALS

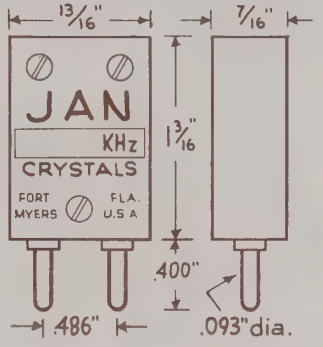
FT-243 Holder ±.005% 32pF Load Capacity
Frequencies not listed in stock are made to order.

Frequency Range:

1900 KHz to 3250 KHz	$3.00 each
3251 KHz to 3750 KHz	$2.50 each
3751 KHz to 4000 KHz	$2.25 each
4001 KHz to 8900 KHz	$2.00 each

FT-243 HOLDER

Type FT-243. A most rugged type having .093 pins and .486 pin spacing (½"). Designed to operate on frequency in 32 pF oscillator circuit. The quartz crystal in this holder is either .5" x .5" or .5" x .6" and is held between two stainless steel electrodes by spring pressure. It is by far the most popular crystal of its type in use.



80 METER NOVICE CRYSTALS FROM 3701 KHz to 3749 KHz — $2.50 Ea.

FT-243 IN-STOCK CRYSTALS

PRESSURE TYPE CRYSTALS

75c TYPE 243
TOL. ±1 KHz

3 for $2.00

We will make to order any frequency from 4000 KHz to 8900 KHz

$2.00 Ea. — Tol. ±.005%

Order by Frequency in Holder Type FT-243

Frequencies listed below are in KHz. Fractions of KHz have been omitted. Frequencies ending in (0) or (5) are exact. Others have fractions of KHz.

3825	5030	5773	6050	6425	6775	7308	7591	7775	8200	8550
3840	5205	5775	6073	6430	6800	7316	7600	7780	8206	8560
3980	5235	5782	6075	6440	6806	7325	7606	7791	8225	8566
4035	5295	5795	6100	6450	6815	7340	7620	7800	8233	8575
4060	5300	5800	6106	6473	6825	7350	7625	7806	8240	8580
4080	5305	5806	6125	6475	6840	7373	7630	7810	8250	8583
4110	5327	5820	6140	6500	6850	7375	7633	7820	8258	8591
4165	5385	5825	6150	6506	6873	7400	7640	7825	8275	8600
4175	5397	5840	6173	6525	6875	7406	7650	7840	8266	8608
4190	5435	5850	6175	6540	6900	7425	7658	7850	8270	8610
4215	5437	5852	6185	6547	6906	7440	7660	7858	8273	8625
4255	5485	5860	6200	6550	6925	7450	7670	7860	8290	8630
4280	5500	5873	6206	6573	6940	7473	7673	7866	8300	8633
4295	5622	5875	6225	6575	6950	7475	7675	7870	8306	8650
4300	5640	5880	6235	6600	6973	7500	7683	7873	8308	8691
4340	5655	5892	6240	6606	6975	7506	7690	7875	8310	8700
4395	5660	5900	6250	6625	7200	7510	7700	7880	8320	
4397	5675	5906	6273	6640	7202	7516	7706	7900	8325	
4495	5677	5925	6275	6650	7203	7520	7720	7906	8340	
4695	5700	5940	6300	6673	7204	7525	7725	7908	8341	
4735	5706	5950	6306	6675	7206	7530	7740	7925	8350	
4780	5722	5955	6325	6700	7225	7533	7741	7930	8375	
4785	5725	5973	6340	6706	7240	7540	7750	7940	8391	
4840	5730	5975	6350	6708	7250	7541	7758	7950	8425	
4845	5740	6000	6373	6725	7273	7550	7760	7958	8470	
4852	5744	6006	6375	6740	7275	7570	7766	7966	8475	
4930	5750	6025	6400	6750	7300	7573	7770	7973	8500	
4950	5760	6040	6406	6773	7306	7575	7773	7975	8525	

LOW FREQUENCY

TYPE 243

All frequencies listed are in stock. Order by freq. and FT-243 holder.

$2.00 EACH

3 for $5.

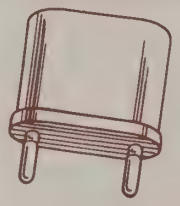
1025	1230	1400	1585	1975	2155	2320	2480	2620	2785
1030	1235	1405	1605	2015	2160	2325	2485	2625	2790
1035	1240	1420	1620	2020	2165	2340	2490	2630	2795
1045	1245	1425	1625	2025	2170	2345	2495	2640	2800
1055	1250	1430	1720	2030	2175	2350	2500	2645	2805
1080	1260	1435	1725	2035	2185	2355	2505	2650	2810
1085	1265	1440	1730	2040	2190	2360	2510	2655	2815
1120	1270	1445	1735	2045	2195	2365	2515	2660	2820
1125	1275	1450	1745	2050	2200	2370	2520	2675	2825
1130	1295	1455	1750	2055	2205	2375	2525	2680	2835
1135	1300	1460	1755	2060	2210	2380	2530	2690	2840
1140	1305	1465	1850	2065	2220	2390	2535	2695	2845
1145	1310	1470	1890	2070	2225	2395	2540	2700	2850
1150	1315	1475	1900	2075	2235	2400	2545	2705	2855
1160	1320	1485	1905	2080	2240	2405	2550	2710	2860
1165	1325	1510	1910	2085	2245	2410	2555	2715	2865
1170	1330	1515	1915	2090	2250	2415	2560	2720	2870
1175	1335	1520	1920	2095	2255	2420	2565	2725	2875
1180	1345	1525	1925	2100	2260	2425	2570	2730	2880
1185	1355	1530	1930	2105	2265	2430	2575	2740	2885
1190	1360	1535	1935	2110	2270	2435	2580	2745	2890
1195	1365	1540	1940	2115	2275	2440	2585	2750	2895
1200	1370	1545	1945	2120	2280	2445	2590	2755	2900
1205	1375	1555	1950	2130	2285	2450	2595	2760	2905
1210	1380	1565	1955	2135	2290	2460	2600	2765	
1215	1385	1570	1960	2140	2300	2465	2605	2770	
1220	1390	1575	1965	2145	2310	2470	2610	2775	
1225	1395	1580	1970	2150	2315	2475	2615	2780	

A REAL CRYSTAL BARGAIN IN SEALED METAL HOLDERS

Special Price

CR7/U 75c

3 for $2.00

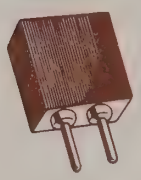


The type CR7/U crystal is mounted in hermetically sealed cans similar to the HC6/U except can is only ½" high. Frequencies listed are in stock for immediate delivery. Made for Navy types "MAR", "TDZ", and "RDZ" sets, they have fine stability and high output. .01% tol. guaranteed. Listed in KHz.

4285.19	5292.59	5703.70	6035.42	6488.89	6922.22
4329.63	5303.70	5714.06	6039.06	6492.59	6933.33
4344.44	5333.33	5722.22	6048.15	6518.52	6962.96
4374.07	5339.06	5739.06	6052.08	6522.22	6977.78
4403.70	5348.15	5748.15	6076.56	6537.04	6985.42
4500.00	5364.06	5751.56	6077.76	6548.15	7018.75
4625.93	5366.67	5776.56	6103.70	6552.08	7022.22
4640.74	5389.06	5781.48	6107.41	6577.78	7051.85
4655.55	5396.30	5785.42	6133.33	6581.48	7052.08
4700.00	5401.56	5789.06	6135.06	6585.42	7070.37
4729.63	5422.22	5801.56	6152.42	6596.30	7081.48
4744.44	5437.04	5802.08	6162.96	6607.41	7085.42
4774.07	5439.06	5807.41	6166.67	6611.11	7096.30
4788.89	5451.85	5811.11	6192.59	6618.75	7100.97
4844.44	5464.06	5814.06	6196.30	6625.93	7114.81
4862.96	5466.67	5818.00	6201.56	6637.04	7125.93
4877.78	5481.48	5826.56	6207.41	6640.74	7129.63
4888.88	5489.06	5835.42	6218.75	6652.08	7140.74
4892.60	5514.80	5837.04	6222.22	6655.56	7144.44
4903.70	5518.75	5839.06	6225.93	6666.67	7155.56
4907.06	5525.93	5840.74	6226.56	6668.75	7159.26
4922.22	5535.42	5851.56	6251.56	6681.48	7170.37
4933.33	5539.06	5852.08	6251.85	6685.42	7185.18
4951.85	5544.44	5870.37	6252.08	6700.00	7214.82
4962.96	5552.08	5876.56	6255.56	6714.81	7218.52
4966.66	5555.55	5885.42	6264.06	6718.75	7244.44
4996.30	5564.06	5889.06	6268.75	6725.93	7259.26
5011.11	5570.37	5900.00	6276.56	6729.63	7274.07
5025.93	5589.19	5901.56	6281.48	6744.44	7288.88
5055.56	5602.08	5902.08	6285.19	6752.00	7303.70
5070.37	5603.70	5914.06	6289.06	6755.56	7316.70
5085.18	5614.82	5925.93	6311.11	6774.07	7329.8
5100.00	5629.63	5926.42	6314.82	6783.33	7333.33
5135.42	5633.33	5926.56	6326.56	6785.16	7362.96
5144.44	5635.42	5929.63	6340.74	6785.42	7377.78
5174.07	5639.06	5935.42	6344.44	6803.70	7407.40
5185.18	5644.44	5952.08	6352.07	6805.00	7422.22
5188.89	5648.15	5955.56	6370.37	6814.81	7437.04
5200.00	5651.56	5959.26	6374.07	6818.75	7481.48
5202.08	5652.08	5968.75	6385.42	6844.44	7629.63
5214.82	5659.26	5976.56	6400.00	6852.08	7659.26
5235.42	5662.96	5988.89	6403.70	6862.96	7674.07
5248.15	5685.42	5989.06	6418.52	6874.07	7688.89
5259.26	5688.89	6002.08	6429.63	6877.78	7703.70
5268.75	5689.59	6014.06	6459.26	6885.42	7718.52
5277.78	5701.56	6018.75	6462.96	6903.70	7733.33
5288.89	5702.08	6026.56	6477.78	6918.75	7777.78

WRITE FOR QUANTITY DISCOUNTS

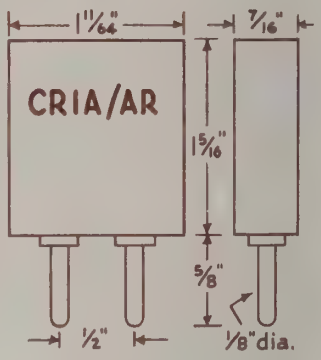
"SPECIAL" PRESSURE TYPE CRYSTALS PLUS FREE SOCKET!



75c Ea.

3 for $2.00

This pressure type crystal has identical electrical data as the famous FT-243 type. The CRIA/AR is slightly larger than the FT-243 and has ⅛" dia. pins with ½" spacing.
All frequencies listed are in KHz and are guaranteed ±1KHz. They are in stock for immediate delivery. Fractions of KHz have been omitted. Free crystal socket included with every order for CRIA/AR type crystals.



5070	6238	6600	6994	7580	8002	8146	8262	8367	8468
5179	6240	6607	7010	7600	8006	8148	8264	8368	8469
5386	6250	6610	7072	7606	8007	8154	8266	8374	8474
5565	6260	6627	7077	7615	8013	8155	8269	8378	8475
5570	6280	6630	7083	7635	8020	8156	8270	8380	8477
5600	6300	6632	7094	7643	8021	8161	8275	8383	8481
5620	6310	6633	7172	7655	8029	8162	8278	8385	8486
5625	6395	6638	7188	7660	8030	8170	8280	8389	8488
5626	6417	6643	7200	7700	8035	8171	8284	8390	8492
5640	6420	6650	7205	7705	8036	8173	8285	8392	8494
5645	6425	6680	7210	7710	8037	8175	8290	8395	8500
5649	6450	6688	7280	7715	8040	8178	8296	8405	8512
5650	6460	6694	7290	7730	8041	8182	8298	8407	8528
5655	6461	6705	7311	7745	8044	8184	8301	8408	8530
5665	6466	6711	7330	7772	8046	8185	8304	8409	8535
5710	6467	6722	7338	7780	8047	8186	8306	8410	8541
5722	6470	6725	7344	7800	8050	8187	8310	8413	8550
5730	6472	6727	7350	7810	8058	8188	8312	8416	8575
5740	6475	6730	7372	7822	8060	8190	8314	8423	8580
5768	6479	6744	7390	7830	8064	8198	8315	8425	8585
5790	6480	6749	7420	7850	8071	8200	8317	8428	8600
5800	6485	6750	7444	7855	8078	8206	8318	8429	8607
5810	6488	6754	7455	7860	8080	8210	8320	8430	8622
5835	6490	6772	7460	7870	8090	8214	8325	8431	8629
5875	6497	6788	7470	7880	8092	8215	8326	8435	8630
5927	6500	6805	7477	7890	8106	8220	8328	8436	8640
5945	6510	6816	7508	7891	8114	8223	8330	8438	8645
5950	6511	6838	7516	7910	8118	8225	8334	8440	8650
5955	6516	6860	7520	7922	8121	8227	8338	8441	8660
5975	6520	6870	7525	7933	8123	8228	8345	8442	8661
6030	6522	6880	7540	7950	8126	8235	8347	8446	8676
6090	6527	6890	7544	7960	8128	8236	8351	8449	8686
6100	6547	6894	7550	7962	8133	8240	8353	8450	8702
6150	6550	6895	7558	7969	8135	8242	8356	8452	8710
6160	6554	6927	7560	7990	8138	8252	8360	8463	8870
6200	6560	6938	7565	7992	8140	8253	8361	8464	
6227	6593	6983	7570	8001	8145	8260	8362	8465	

CRYSTAL SOCKETS — Order by Number

SS0-1 ..... 15¢
Single Socket for HC17/U, FT-243 or FT-241. LOW LOSS BAKELITE

CE-1 ..... 20¢
Ceramic Low Loss Socket for HC6/U Holder— ½" Pin Spacing — .05" Holes

DSO-2 ..... 15¢
Dual Sockets for FT-243 and FT-241 or two FT-243 Crystals

DSC-4 ..... 25¢
Socket for MC-7

DSC-3 ..... 20¢
Socket for DC-34 or FT-171A

CE-25 ..... 20¢
Ceramic Low Loss Socket, P.C. Mounting for HC25/U Type Crystal

HIGH QUALITY CRYSTAL OVENS

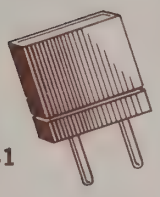
The ovens listed are new and fully guaranteed. Priced at a fraction of their original cost.

Stock No. LA-1 — Lavoie oven for base stations 115 volts AC. Dimensions — 4" high x 1⅞ x 1½ — fits octal socket, 75°C.

$7.50

LOW FREQUENCY TYPE CRYSTALS

370 KHz to 540 KHz in FT-241 Holders



FT-241

2 crystals fit std. octal socket pin spacing .486, pin dia. .093

FOR LATTICE NETWORKS — SINGLE SIDE BAND — LOW FREQUENCY OSCILLATORS — MARKERS — ETC. All crystals listed are fundamental frequencies in kilocycles. Channels 0 to 79 and channels 270 to 289 comprise sets of 80 and 120 crystals.

75c Ea. 3 for $2.00

ORDER BY CHANNEL NUMBER AND FREQUENCY

NOMINAL CRYSTAL FREQ. KC	CHANNEL NO.	NOMINAL CRYSTAL FREQ. KC	CHANNEL NO.	NOMINAL CRYSTAL FREQ. KC	CHANNEL NO.	NOMINAL CRYSTAL FREQ. KC	CHANNEL NO.	NOMINAL CRYSTAL FREQ. KC	CHANNEL NO.	NOMINAL CRYSTAL FREQ. KC	CHANNEL NO.	NOMINAL CRYSTAL FREQ. KC	CHANNEL NO.	NOMINAL CRYSTAL FREQ. KC	CHANNEL NO.
370.370	0	393.055	283	413.888	298	434.722	313	456.944	329	477.777	344	498.148	69	522.222	376
372.222	1	394.444	13	414.815	24	435.037	35	457.407	47	477.778	58	498.611	359	523.611	377
374.074	2	394.444	284	415.277	299	436.111	314	458.833	330	479.166	345	501.388	361	525.000	378
375.000	270	395.833	285	416.666	300	437.037	36	459.259	48	479.630	59	501.852	71	526.388	379
375.926	3	396.292	14	416.667	25	437.500	315	459.722	331	480.555	346	502.777	362	527.777	380
376.388	271	397.222	286	418.055	301	438.888	316	461.111	49	481.481	60	503.704	72	529.166	381
377.777	272	398.148	15	418.519	26	438.889	37	461.111	332	481.944	347	504.166	363	530.555	382
377.778	4	398.611	287	419.444	302	440.277	317	462.500	333	483.333	61	505.555	364	531.944	383
379.166	273	400.000	16	420.370	27	440.741	38	462.963	50	483.333	348	505.556	73	533.333	384
379.630	5	400.000	288	420.833	303	441.666	318	463.388	334	484.722	349	506.944	365	534.722	385
380.555	274	401.388	289	422.222	28	442.593	39	464.815	51	485.185	62	507.407	74	536.111	386
381.481	6	401.852	17	422.222	304	443.055	319	465.277	335	486.111	350	508.333	366	537.500	387
381.944	275	402.777	290	423.611	305	444.444	40	466.666	336	487.037	63	509.259	75	538.888	388
383.333	7	403.704	18	424.074	29	444.444	320	466.667	52	487.500	351	509.722	367	540.277	389
383.333	276	404.166	291	425.000	306	445.833	321	468.055	337	488.888	352	511.111	76		
384.722	277	405.555	292	425.926	30	446.296	41	468.519	53	488.889	64	511.111	368		
385.185	8	405.556	19	426.388	307	447.222	322	469.444	338	490.277	353	512.500	369		
386.111	278	406.944	293	427.777	308	448.148	42	470.370	54	490.741	65	512.963	77		
387.037	9	407.407	20	427.778	31	448.611	323	470.833	339	491.666	354	513.888	370		
387.500	279	408.333	294	429.166	309	450.000	43	472.222	55	492.593	66	514.815	78		
388.888	280	409.259	21	429.630	32	450.000	324	472.222	340	493.055	355	515.277	371		
388.889	10	409.722	295	430.555	310	451.388	325	473.611	341	494.444	67	516.666	372		
390.277	281	411.111	22	431.481	33	451.852	44	474.074	56	494.444	356	516.667	79		
390.741	11	411.111	296	431.944	311	452.777	326	475.000	342	495.833	357	518.055	373		
391.666	282	412.500	297	433.333	34	453.704	45	475.926	57	496.296	68	519.444	374		
392.593	12	412.963	23	433.333	312	454.166	327	476.388	343	497.222	358	520.833	375		

FT241 LOW FREQUENCY CRYSTALS FROM 729 KHz TO 1040 KHz

Channel	Crystal Freq. KC	Channel	Crystal Freq. KC	Channel	Crystal Freq. KC	Channel	Crystal Freq. KC	Channel	Crystal Freq. KC	Channel	Crystal Freq. KC	Channel	Crystal Freq. KC	Channel	Crystal Freq. KC	Channel	Crystal Freq. KC
70.1	730.208	73.5	765.625	76.9	801.042	80.3	836.458	83.7	871.875	87.1	907.292	90.5	942.708	93.9	978.125	97.4	1014.583
70.2	731.250	73.6	766.667	77.0	802.083	80.4	837.500	83.8	872.917	87.2	908.333	90.6	943.750	94.0	979.167	97.5	1015.625
70.3	732.292	73.7	767.708	77.1	803.125	80.5	838.542	83.9	873.958	87.3	909.375	90.7	944.792	94.1	980.208	97.6	1016.667
70.4	733.333	73.8	768.750	77.2	804.167	80.6	839.583	84.0	875.000	87.4	910.417	90.8	945.833	94.2	981.250	97.7	1017.708
70.5	734.375	73.9	769.792	77.3	805.208	80.7	840.625	84.1	876.042	87.5	911.458	90.9	946.875	94.3	982.292	97.8	1018.750
70.6	735.417	74.0	770.833	77.4	806.250	80.8	841.667	84.2	877.083	87.6	912.500	91.0	947.917	94.4	983.333	97.9	1019.792
70.7	736.458	74.1	771.875	77.5	807.292	80.9	842.708	84.3	878.125	87.7	913.542	91.1	948.958	94.5	984.376	98.0	1020.833
70.8	737.500	74.2	772.917	77.6	808.333	81.0	843.750	84.4	879.167	87.8	914.583	91.2	950.000	94.6	985.417	98.1	1021.875
70.9	738.542	74.3	773.958	77.7	809.375	81.1	844.792	84.5	880.208	87.9	915.625	91.3	951.042	94.7	986.458	98.2	1022.917
71.0	739.583	74.4	775.000	77.8	810.417	81.2	845.833	84.6	881.250	88.0	916.667	91.4	952.083	94.8	987.500	98.3	1023.958
71.1	740.625	74.5	776.042	77.9	811.458	81.3	846.875	84.7	882.292	88.1	917.708	91.5	953.125	94.9	988.542	98.4	1025.000
71.2	741.667	74.6	777.083	78.0	812.500	81.4	847.917	84.8	883.333	88.2	918.750	91.6	954.167	95.0	989.583	98.5	1026.042
71.3	742.708	74.7	778.125	78.1	813.542	81.5	848.958	84.9	884.375	88.3	919.792	91.7	955.208	95.1	990.625	98.6	1027.083
71.4	743.750	74.8	779.167	78.2	814.583	81.6	950.000	85.0	885.417	88.4	920.833	91.8	956.250	95.2	991.667	98.7	1028.125
71.5	744.792	74.9	780.208	78.3	815.625	81.7	851.042	85.1	886.458	88.5	921.875	91.9	957.292	95.3	992.708	98.8	1029.167
71.6	745.833	75.0	781.250	78.4	816.667	81.8	852.083	85.2	887.500	88.6	922.917	92.0	958.333	95.4	993.750	98.9	1030.208
71.7	746.875	75.1	782.292	78.5	817.708	81.9	853.125	85.3	888.542	88.7	923.958	92.1	959.375	95.5	994.792	99.0	1031.250
71.8	747.917	75.2	783.333	78.6	818.750	82.0	854.167	85.4	889.583	88.8	925.000	92.2	960.417	95.6	995.833	99.1	1032.292
71.9	748.958	75.3	784.375	78.7	819.792	82.1	855.208	85.5	890.625	88.9	926.042	92.3	961.458	95.7	996.875	99.2	1033.333
72.0	750.000	75.4	785.417	78.8	820.833	82.2	856.250	85.6	891.667	89.0	927.083	92.4	962.500	95.8	997.917	99.3	1034.375
72.1	751.042	75.5	786.458	78.9	821.875	82.3	857.292	85.7	892.708	89.1	928.125	92.5	963.542	95.9	998.958	99.4	1035.417
72.2	752.083	75.6	787.500	79.0	822.917	82.4	858.333	85.8	893.750	89.2	929.167	92.6	964.583	96.1	1001.042	99.5	1036.458
72.3	753.125	75.7	788.542	79.1	823.958	82.5	859.375	85.9	894.792	89.3	930.208	92.7	965.625	96.2	1002.083	99.6	1037.500
72.4	754.167	75.8	789.583	79.2	825.000	82.6	860.417	86.0	895.833	89.4	931.250	92.8	966.667	96.3	1003.125	99.7	1038.542
72.5	755.208	75.9	790.625	79.3	826.042	82.7	861.458	86.1	896.875	89.5	932.292	92.9	967.708	96.4	1004.167	99.8	1039.583
72.6	756.250	76.0	791.667	79.4	827.083	82.8	862.500	86.2	897.917	89.6	933.333	93.0	968.750	96.5	1005.208	99.9	1040.625
72.7	757.292	76.1	792.708	79.5	828.125	82.9	863.542	86.3	898.958	89.7	934.375	93.1	969.792	96.6	1006.250		
72.8	758.333	76.2	793.750	79.6	829.167	83.0	864.583	86.4	900.000	89.8	935.417	93.2	970.833	96.7	1007.292		
72.9	759.375	76.3	794.792	79.7	830.208	83.1	865.625	86.5	901.042	89.9	936.458	93.3	971.875	96.8	1008.333		
73.0	760.417	76.4	795.833	79.8	831.250	83.2	866.667	86.6	902.083	90.0	937.500	93.4	972.917	96.9	1009.375		
73.1	761.458	76.5	796.875	79.9	832.292	83.3	867.708	86.7	903.125	90.1	938.542	93.5	973.958	97.0	1010.417		
73.2	762.500	76.6	797.917	80.0	833.333	83.4	868.750	86.8	904.167	90.2	939.583	93.6	975.000	97.1	1011.458		
73.3	763.542	76.7	798.958	80.1	834.375	83.5	869.792	86.9	905.208	90.3	940.625	93.7	976.042	97.2	1012.500		
73.4	764.583	76.8	800.000	80.2	835.417	83.6	870.833	87.0	906.250	90.4	941.667	93.8	977.083	97.3	1013.542		

POPULAR CRYSTALS IN FT-241 HOLDERS ±.01 TOL.

455 KHz $2.75
500 KHz $2.75

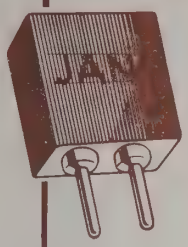
WE WILL MAKE TO ORDER ANY FREQUENCY FROM 370 KHz TO 540 KHz AND 730 KHz TO 1040 KHz IN FT-241 HOLDERS AT $1.75 EACH ±.01 TOL.

RAW BRAZILIAN QUARTZ
FOR "ROCK HOUNDS"

We can supply radio grade quartz imported from Brazil at 50¢ per piece (approx. ¼ lb.) or $1.75 a pound. A good conversation piece.

NOTICE

We will buy all type HC/6 or miniature type HC18/U or HC25/U crystals at 5¢ each, or we will allow 10¢ each for the above types as credit on your orders for any crystals ordered from this catalog. Send crystals with your order.



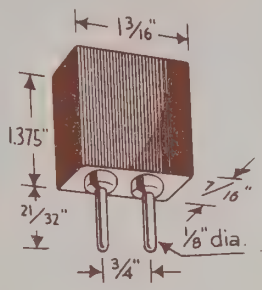
TYPE CR1A/AR CRYSTAL HOLDER

This pressure type crystal is designed for rugged service. Pins are ⅛" dia. with ½" spacing. Supplied in frequencies 3000 to 8750 MHz.

All Amateur band frequencies	**$2.00 Ea.**
Commercial frequencies	**$3.75 Ea.**

Order by frequency and holder type CR1A/AR.

MADE TO ORDER TYPE MC7 PRESSURE TYPE CRYSTALS



These heavy duty crystals are used in many marine sets. We will make to order any frequency in MC7 holders.

1650 KHz to 2000 KHz	**$2.75 Ea.**
2001 KHz to 5000 KHz	**$2.50 Ea.**

NOTE: Special, synthesized and Business Band Crystals are made only by special request and are priced differently.

JAN CRYSTALS

You Can Depend On

CITIZENS BAND CRYSTALS

We make to order ALL Standard Channel Frequencies (1 to 23) for most of the Citizen Band Transceivers. When ordering, specify channel, Make and Model, Transmit or Receive.

$2.50 Ea.

10 or More Per Order At $2.25

2400 CRYSTAL DRIVE • FT. MYERS, FLORIDA 33901

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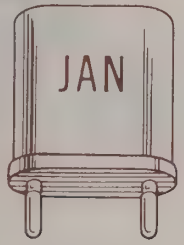
Ft. Myers, Fla.



CATALOG NO. 17

1974

ADDRESS CORRECTION REQUESTED

7309.36

FM1 10.7 Mc IF

Repeater

146.76R + 10.7 = 157.46 ÷ 3 = 52,48666 X Tal Rec

146.76 − 10.7 = 136.06 ÷ 3 45,35333 X Tal Rec

5/10/74

75

CRYSTALS HFM-1 10.7 MC MODEL

HFM-1
10.7MC IF MODEL

1st LOCAL OSC; holder HC 25/U TYPE Crystal CR 55/U

FREQ = $\frac{\text{freq channel} + 10.697}{3}$ to be tripled to $f_{channel} - \frac{3}{8}$ KC, possibly f raised by oscillator circuit to give 10.700 MC 1ST IF.

2nd local osc; holder HC 25U MODE Series or parallel? Load? pF or uH? TYPE crystal CR78/U

freq = 11.155 MC 10.700 + .455 = 11.155 MC

Mode Series or parallel? Load? pF or uH?

Transmit: $f_{channel} \div 12$ crystal type CR78/U

Mode Series or parallel? Load? pF or uH?

Notes: Hammerlund diagram 9016-04-00001 Costa Rica and Laos Schematic diagram

" 1813-01-00001 } L111 455Kc discriminator
00002 } L112 Transformer.

" 2306-01-00001 Transmit crystal

2305-01-00088 11.155 rec. crystal

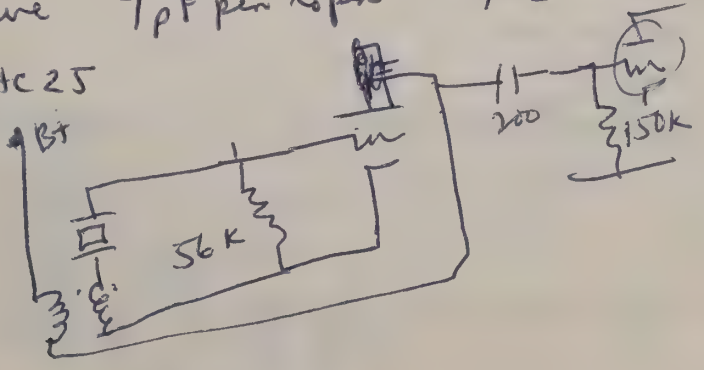
2306-01-00002 Receive 1ST osc crystal

~~223.94~~ 222, 34

223.94

~~215.7~~

CR-55/U HF+VHF metal plated wire mounted
3rd harmonic mechanical series resonance 17-61 MC
±.005% at 2 MW drive 7pF pin to pin 40Ω
-55 to +105°C
HC 18U or HC 25



XTals for 222.34 xmit and 223.94 Rec

osc Mod TRip doub doub amp amp amp 222.34 ÷ 12 = 18.52833

37.0566 111.169 222.34
osc Mod Trip Trip doub amp amp amp (222.34 T ÷ 18 = 12.35222)

12.35222

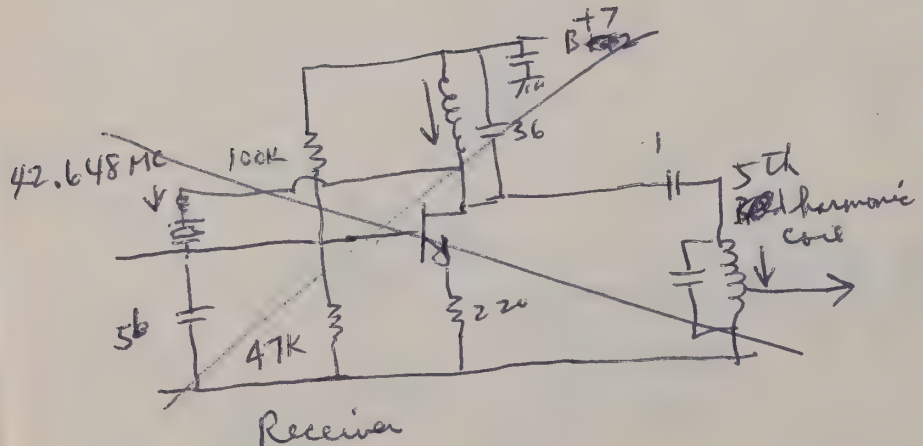
12.35222 MC HC 25/U ±0.0025 parallel resonance 32 pF. Xtal oven
stamp 222.34T $5.00

~~your circuit~~

213.24
Receiver (223.94 − 10.7) ÷ 3 = 71.08 X 3 =
÷ 6 = 35 54

213.24
223.94 − 10.7 ÷ 5 = (42.648) X 5 =

42.66 Bobs Miller



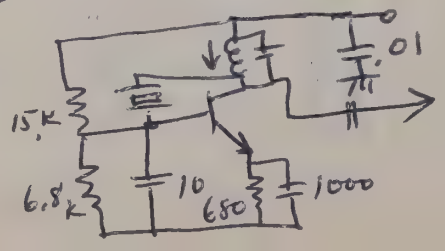
Receiver

42.648 MC HC 25/U ±.0025 ~~10000~~ overtone crystal, series resonant

$5.00ea stamp 223.94R

71.08 MC
$5.00ea

your circuit



$2 \cdot 2 = 4_{(5)}$ $2 \cdot 3 \cdot 3 = 18$

$2 \cdot 3 \cdot = 6$

$2 \cdot 2 \cdot 2 = 8$

$3 \cdot 3 = 9_{(10)}$

$2 \cdot 2 \cdot 3 = 12_{(15)}$

T 148 ÷ 18 8,222 Mc

÷ 12 12,333

÷ 9 16,444

÷ 8 18,499

÷ 6 24,666

T 222,34 ÷ 18 12,3522 T

÷ 12 18,528 T

÷ 9

213,24

R R(223,94 − 10,7) ÷ 3 = 71,08

÷ 4 53,31

÷ 5 42,648

÷ 6 35,54

÷ 8 26,655

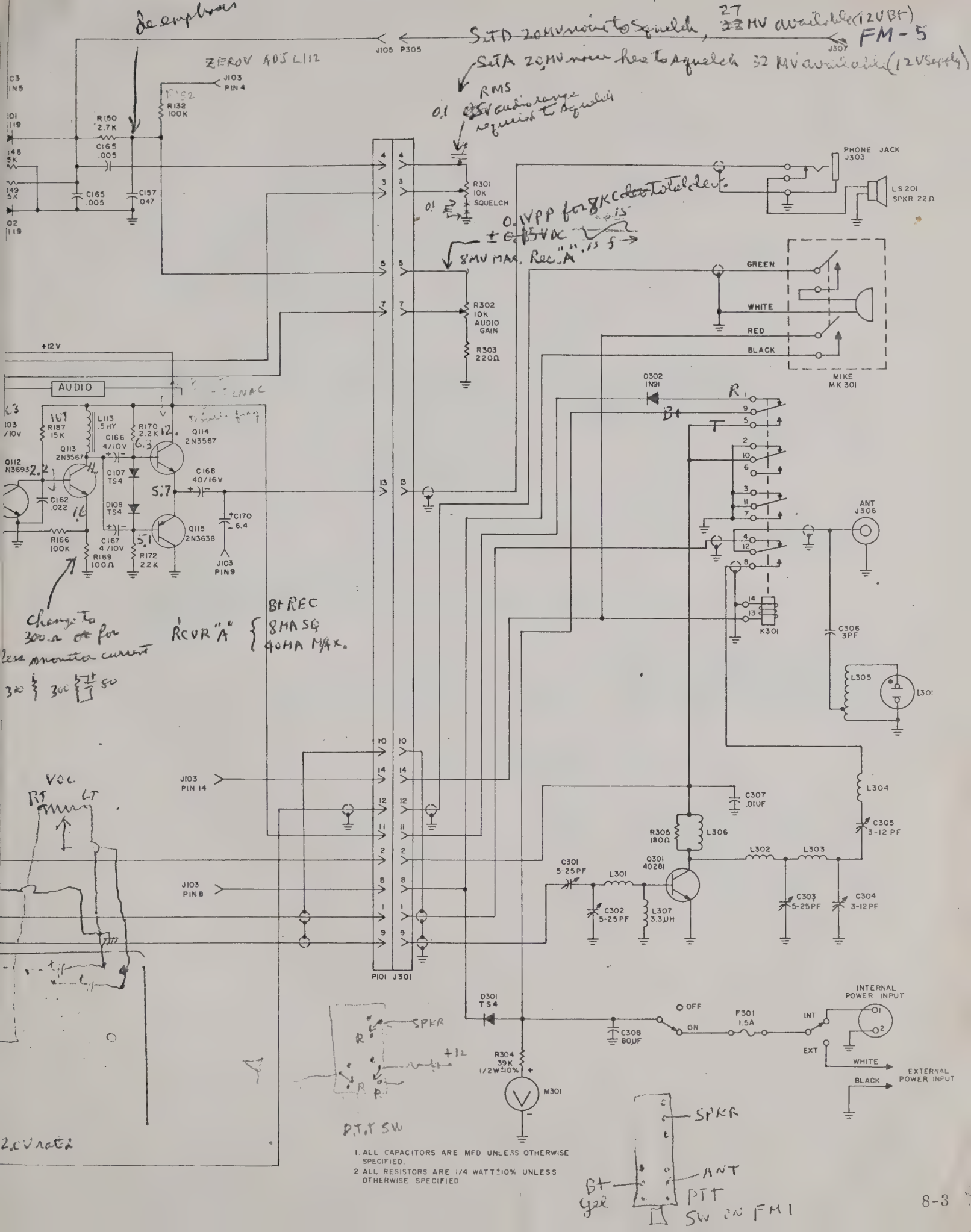
÷ 9 23,6933

÷ 12 17,77

10,7

~~10,7 X 20 = 214 − 213,24 = 0,76 Mc~~

$10,7 \times 21 = 224,7 - 213,24 = 11,46 - 11,155 = 305\,Kc$


FM-5
J105 P305
J307
ZERO V ADJ L112
J103 PIN 4
R150 2.7K
R132 100K
C165 .005
C157 .047
C165 .005
R301 10K SQUELCH
R302 10K AUDIO GAIN
R303 220Ω
PHONE JACK J303
LS 201 SPKR 22Ω
GREEN
WHITE
RED
BLACK
MIKE MK 301
+12V
AUDIO
L113 .5 HY
R187 15K
R170 2.2K
C166 4/10V
Q114 2N3567
Q113 2N3567
Q112 N3693
C162 .022
D107 TS4
D108 TS4
C168 40/16V
C170 6.4
C167 4/10V
R166 100K
R169 100Ω
R172 2.2K
Q115 2N3638
J103 PIN 9
D302 IN91
B+
ANT J306
K301
C306 3PF
L305
L301
C307 .01UF
L304
C305 3-12 PF
R305 180Ω
L306
L302
L303
C301 5-25PF
L301
Q301 40281
C302 5-25PF
L307 3.3μH
C303 5-25PF
C304 3-12PF
J103 PIN 14
J103 PIN 8
P101 J301
D301 TS4
C308 80μF
OFF
ON
F301 1.5A
INT
EXT
INTERNAL POWER INPUT
WHITE
BLACK
EXTERNAL POWER INPUT
R304 39K 1/2W ±10%
M301
SPKR
+12
P.T.T SW
SPKR
ANT
B+ yel
PTT
SW in FM1
1. ALL CAPACITORS ARE MFD UNLESS OTHERWISE SPECIFIED.
2 ALL RESISTORS ARE 1/4 WATT ±10% UNLESS OTHERWISE SPECIFIED
RCVR "A"
B+ REC
8MA SQ
40MA MAX.
8-3

3/30/64

Transceiver performance at Various Locations

Hammarlund FM-1 hand held walkie talkies

Base receiver on dining room table 344 Royal Pines Drive.

Pisgah repeater 146.16 in, 146.76 out and simplex 146.52 Mc

Noise Measurements: A.C. VTVM (Heath), set at 0 dB, no signal noise across loudspeaker Terminals by vol control, ~~squelch~~ non squelched. Best location taken by moving receiver to best site at head height

1. Walnut Cove 2915 .52 Big fill ~~18~~ 15, 2nd 18dB (16)
2. Sleepy gap 2930 about 20' above overlook 20-30 (25 average)
   100 ft away
   Can see Brown mt, ~~Wilson~~ No direct line of sight
3. Pine mt tunnel E side beginning shoulder (28dB)
   direct line of sight
4. ~~overlook~~ 2305, no sign, E side of ~~overlook before~~ Fort Mt Tunnel no contact
5. W side of Fort mt. Tunnel, overlook, 28dB - 25dB (26dB)
6. Overlook Buck Springs gap, ~~not~~ set mt Pisgah 30-~~34~~ ~~25~~ ~~27~~ ~~25~~ (32 32 Horiz pilot ~~26dB~~ ~~26dB~~ horizontal)
7. overlook no one
8. 1½ mi W ~~Pres~~ Wrightsville, an overlook head height
   Steep drop off
   upstairs ¼ ~~dd~~ wave whip
   ½ wave outside on

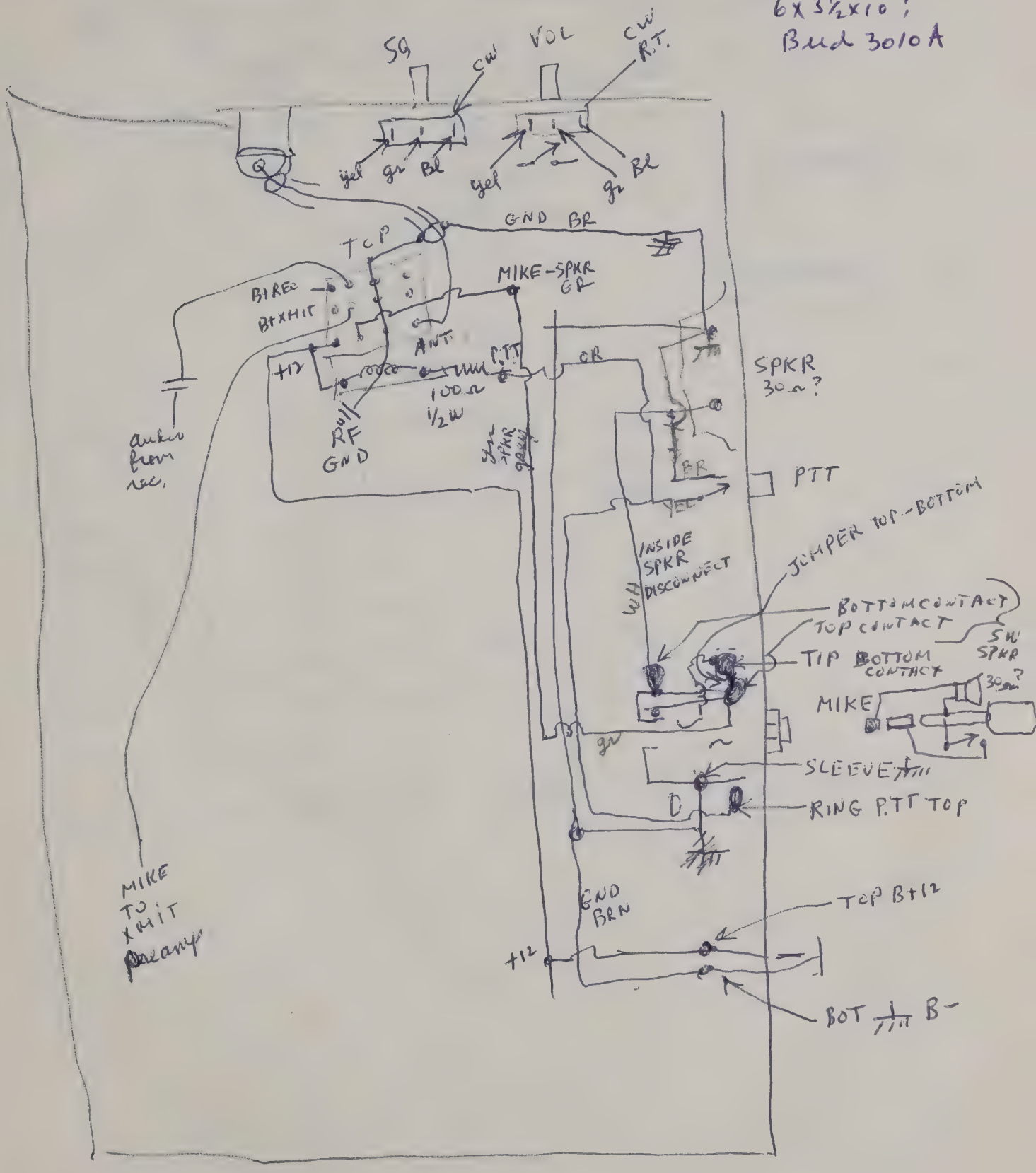
18 - 23 (20)

35dB upstairs

Various 30-40 (30 av)

FM11 – "C" Chassis 4051

Chassis
6 x 3½ x 10 ?
Bud 3010A



$360^\circ = 2\pi$ rad

$180^\circ = \pi$ radians

$1^\circ = \frac{1}{180^\circ}\pi$ radians

1 degree $= \left(\frac{1}{180}\right)\pi$ radians

2π rad $= 360^\circ$

π rad $= 180^\circ$

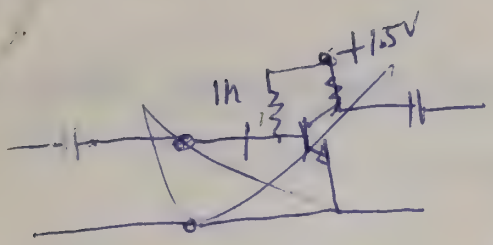
1 rad $= \frac{180^\circ}{\pi}$

$12^\circ \text{deg} = \frac{120}{180}\pi$

20 $\frac{\pi \text{ rad}}{5} \times \left(\frac{180^\circ}{1 \text{ rad}}\right) = 36^\circ$ $\frac{\pi \text{ rad}}{5} \times \frac{\quad}{1 \text{ rad}}$

24 $\frac{7}{24}\pi \text{ rad}\left(\frac{180}{1 \text{ rad}}\right) =$

25.



78,38
39,19

156.76 40th to 78th harmonic of 2-4 mc

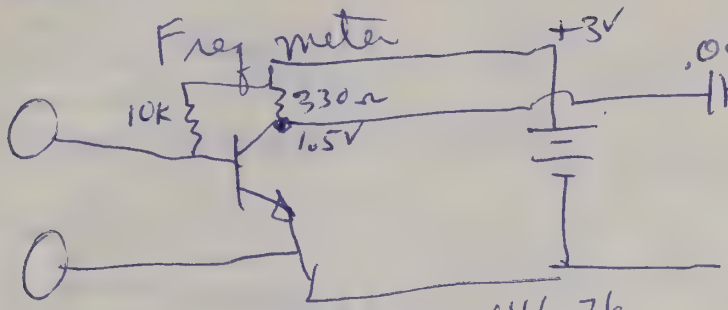
$\frac{156.76}{40} = 3.919$ dial 45.47

$\frac{41}{} = 3,8234$ 43 19

.005 / 39 = 3763 4178

~~3763~~

3739



41 86.0 x 39 = 146.76

dial freq

32 19.5 16.711 IF

146.76

16.711

3951 IF RF3714 dial freq

3942	81	423	3720			
3861	68	432	380	44 | 11.8	3.8621	152.5
3838		435	382			
3770 home	68	443	389			
3763	7	444	3900	41 | 86.0	3.76x30	
3739	23	446	3925			
3716 home	23	371	394			
3668	48	4,555	400	39 | 59.5	3.669	

Transceiver No 2

Joe Brotherton
Lafayette

Like No 1, except:

1. no P.T.T. switch, so
   A. use relay?
   B. use rotary switch, spring loaded? normally receive?

2. control placement changes
   Rotary switch — in top, off side, near audio choke?
   mike (~~boom~~ put further away from switch

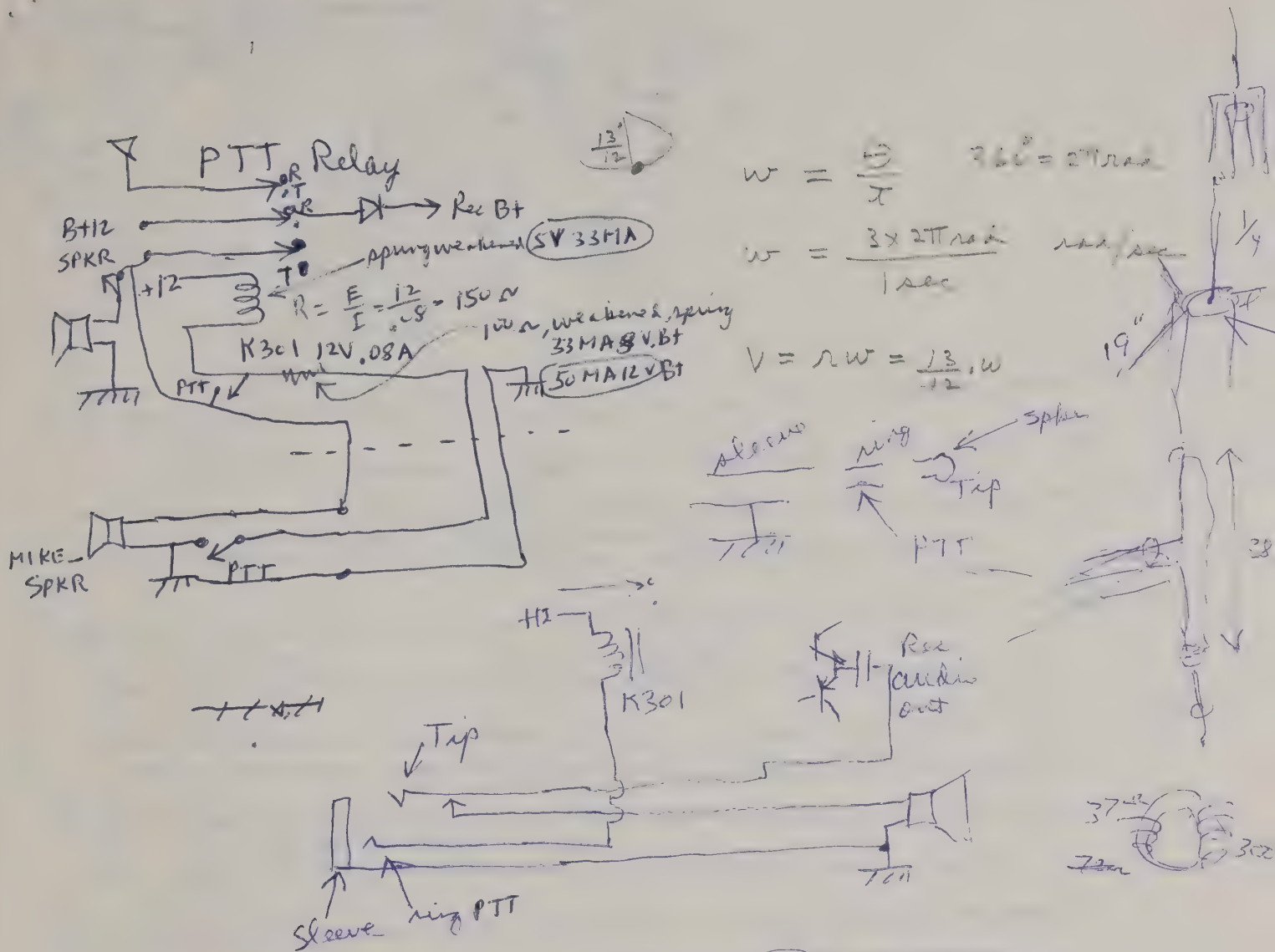
3. extra
   A. P.S. plug for P.S. and for auto Battery
   B. extension speaker + P.T.T. switch?

$9.95 7/4
MON-30 and specialist
10 ft cable, clip on

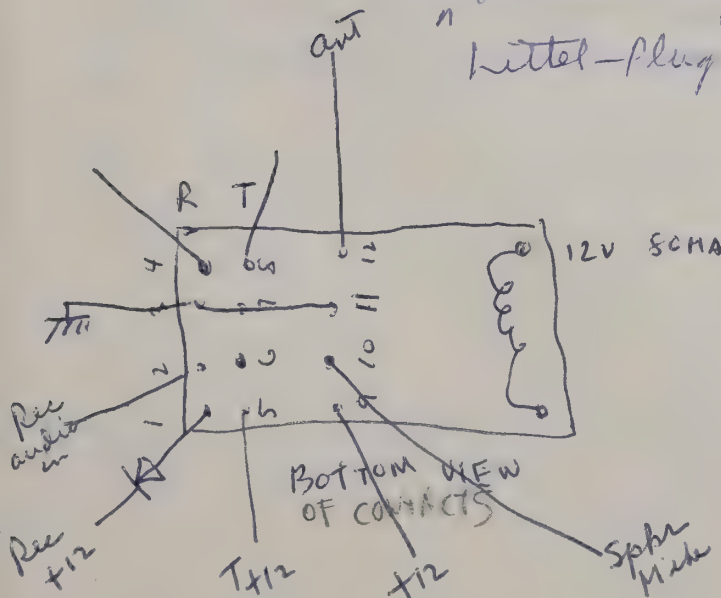
7/4 MON-9 $15.50 magnetic
16 ft

1 Jack 3 cond/w switch ✓
1 Plug 3 cond ✓
2 SPST momentary switch ✓
1 Cigarette lighter Plug Lafayette 99 E 85136 74¢ p381 ✓
1. Suction or magnetic ant 146MC
   ~~coat~~?
1. coax cable connector plug ✓

1 or 2 sets Batteries 8 per set "D" size



~~bell~~ Switchcraft "Littel Jax" type 13 B B 3 conductor
Single closed circuit 60¢ Lafayette
" "Littel-Plug" type ~~297~~ R60-or 267 blank plate
297-metal 99¢



16 76
Greensboro NC
Grafton (Kinston)
Wynnesboro Va
Mt Pisgah 222.34-.94
Atlanta ga T1.8

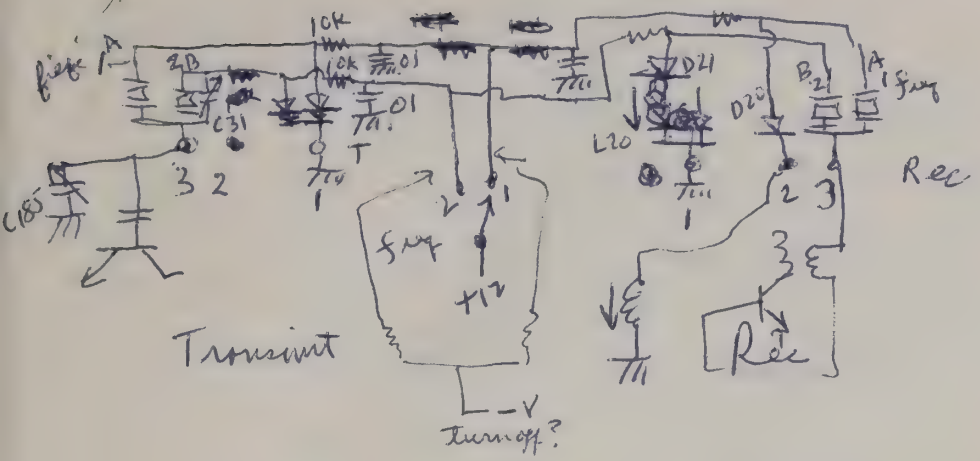
Tampa 441.1 449.1
44.9 448.

4-64
01-61-10-70
88 22-82 16 76
28-34-94 31-91
37-97
46-06

19-79
40-00

Two freq kit!

2-13-74



1. a single pole, double throw switch on panel ~~shorts~~ switches in to circuit either channel A xtals or channel B xtals. These two channels must be set at 600KC & The X mit & Rec coils should be tuned halfway between if necessary so as to function on both frequencies.

2. The 1.2 milliamper current (12V through 10K Ω) switches on ~~one~~ diode to a low resistance connecting one xtal (2B), and the other diode opens up (but still has a large capacitance) to disconnect the other xtal. Maybe a bleeder is required, especially if X mit (parallel, hi res) xtals continue to oscillate

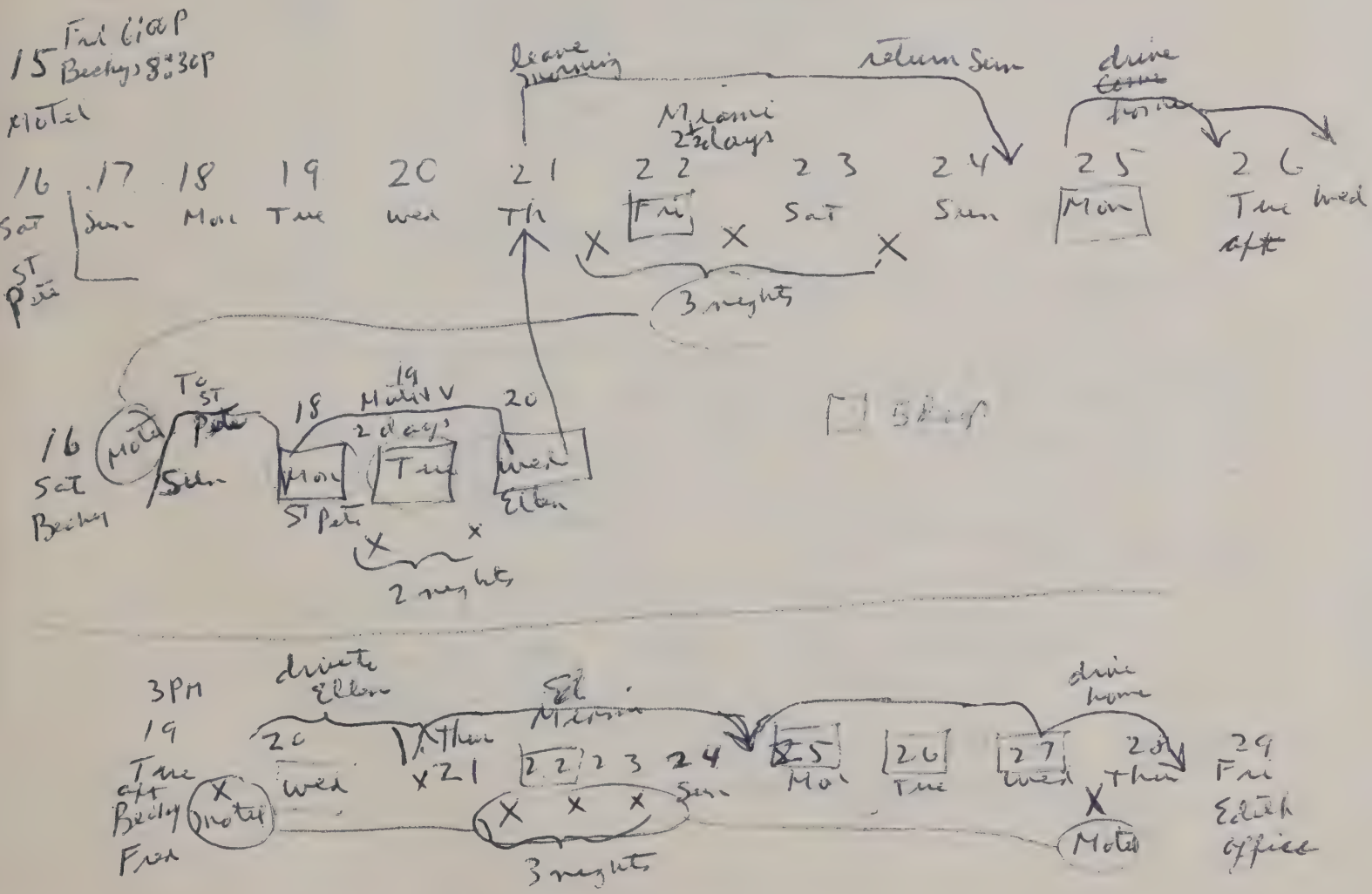
3. The diode "ON" resistance must be low enough so as to allow the rec xtal (series, low resistance) to function, maybe a special diode 1N914?

4. one limitation about freq. trimmers is that ~~on X mit freq~~ B trimmer C185 across xtal A is always in the circuit, so xtal B ~~has~~ has C185 plus C31 as trimmers, thus limiting the range which xtal B can be raised in freq. This should be corrected. Open C185 and add a similar capacitor (2-18 pF) across xtal B 4102A on 2 freq board.

5.

$R = \frac{1}{9}(T - 0{,}455)$

T 146,76	R = 16,256111 /2 = 8.1280555 /	146,76 X18	1,031102
T 146,52	R = 16,229444 /2 = 8,114722 /		1,0031156
T 145	———	8,0302775 /	1,0031482
146	———		
147			



Substitute:

5 days work

Mon	Tu	wed	Fri	Mon	Tue
18	19	20	22	25	26? Mon

20 wed	22 Fri	25 Mon	26? Tue	27 wed

~~146.16 = 146.76~~ 146.52

T 8.120

R ~~16.~~

146.52 ÷ 18 = 8.14 T

146.52 − 0.455 ÷ 9 = 16,229444

146.52

R = T − 1.125R ← R = 120.83557

$T = 0.455 + \frac{1}{8}R + R = 146.52\,Mc$

(8R) ← 129.83552

$1.125R = T - 0.455$ → 8/9

$R = 0.888888(T - 0.455) = 129.83555$

IF 16.68448 ← Ratio

(IR) − 16,229444 ← 0.455

R 16.22944 — Ratio = 1.003115

T 8.14 x2 = 16.280 T−R = 0.05056 X 9 = 0.45504

−R 8.11472 } Ratio = 1.0031153

*T 8.14000 }

= 0.02528 X18 = 0.45504

X mit is 1.0031153 of Rec freq = 25.28 Kc shift

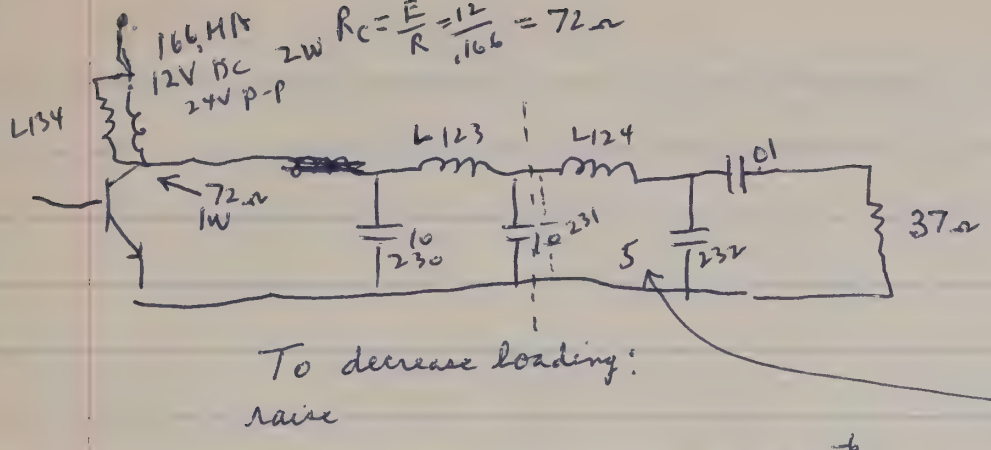
8.140 Mc

8.11472 Mc

x18 = 455 Kc

T 8.140 − 25.28 Kc = 8.11472 x 16 = 129.83552 IF

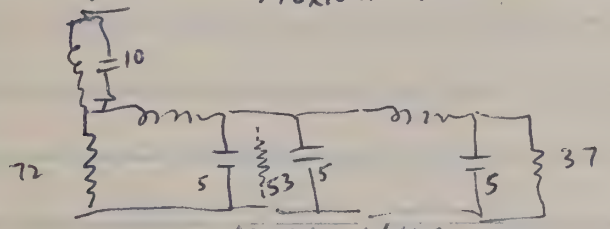
~~8.140 − 25.28 Kc = 8.11528 x~~



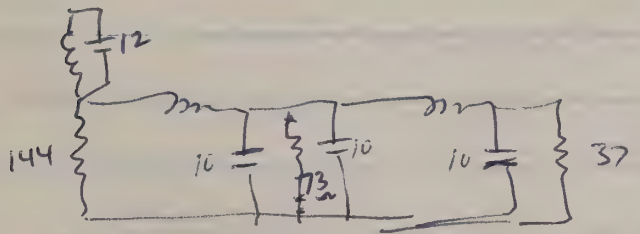
To decrease loading:

raise

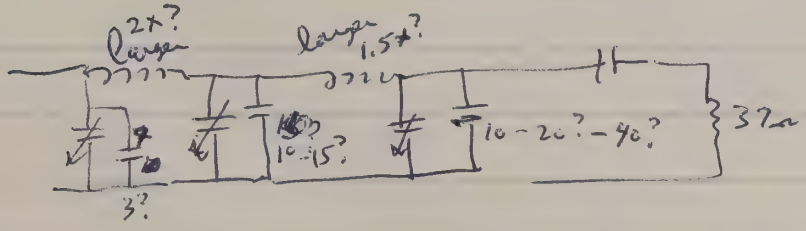
$$X_C = \frac{0.159}{f\,C} = \frac{0.159}{146\times10^{6} \times 5\times10^{-12}} = \frac{.0010994 \times 10^{-6}}{5\times10^{-12}} = .000218\times10^{6} = 218\Omega$$



NOW 161MC 1W



Later ~~1W~~ 1/2 W
146MC



3/30/64

Transceiver performance at Various Locations

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Base receivers on dining room table 344 Royal Pines Drive

Pisgah repeater 146.16 in, 146.76 out and simplex 146.52 Mc

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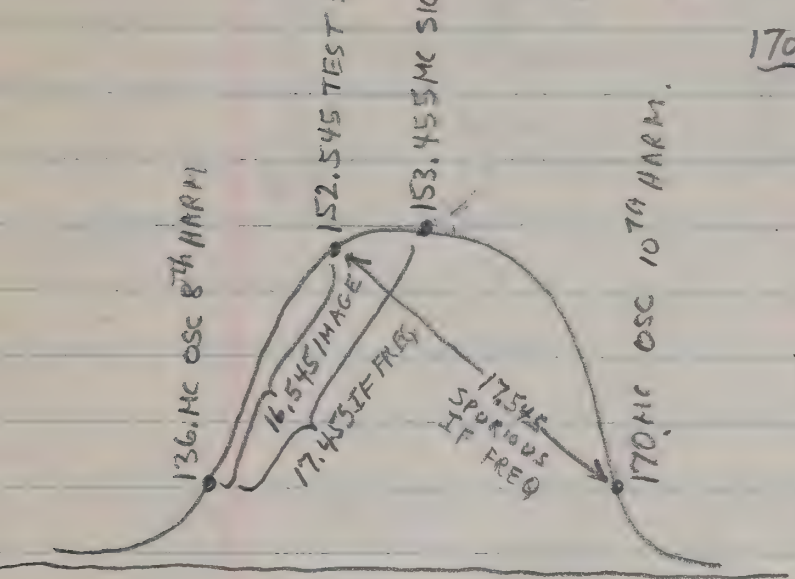
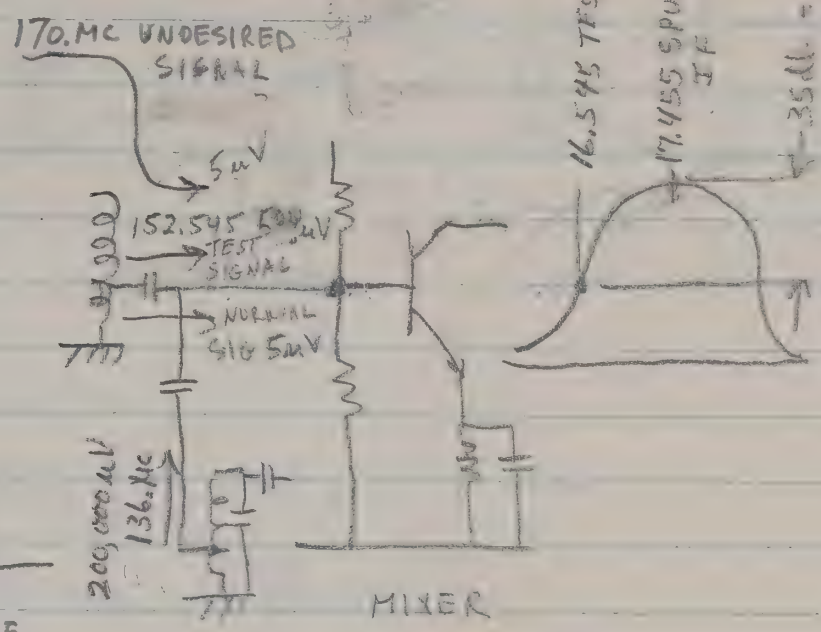
Best location taken by moving receiver to best site at head height

1. Walnut Cove 2915 .52 Big fill 1~~8~~ 1ST 15, 2ND 18dB (16)
2. Sleepy gap 2930 about 20' above overlook 100 ft away 2~~0~~ -30 (25 average)
   Can see Brown mt, ~~...~~ no direct line of sight
3. Pine mt tunnel E side beginning shoulder (28dB)
   direct line of sight
4. ~~...~~ overlook, no sign 2301 ~~overlook before~~ E side of Fort Mt Tunnel no contact
5. W side of Fort mt. Tunnel, overlook, 28dB - 25dB (26dB)
6. Overlook Buck Springs gap, ~~near~~ 50 ft mt Pisgah 30-34 ~~25-27~~ ~~...~~ dB 32 HORIZ POLAR 32 dB ~~20dB~~ ~~26dB~~ horizontal
7. overlook no om
8. 1½ mi W ~~...~~ Wagon gap Rd, on overlook head height
   Steep drop off 18 - 23 (20)
   upstairs ¼ ~~...~~ wave whip (35dB) upstairs
   ½ wave outside out Varying 30-40 (30 av)

FM-5 Spurious response due to a oscillator 10th harmonic 77db down, 10% mixer voltage efficiency assumed for spurious frequency.

10/18/66





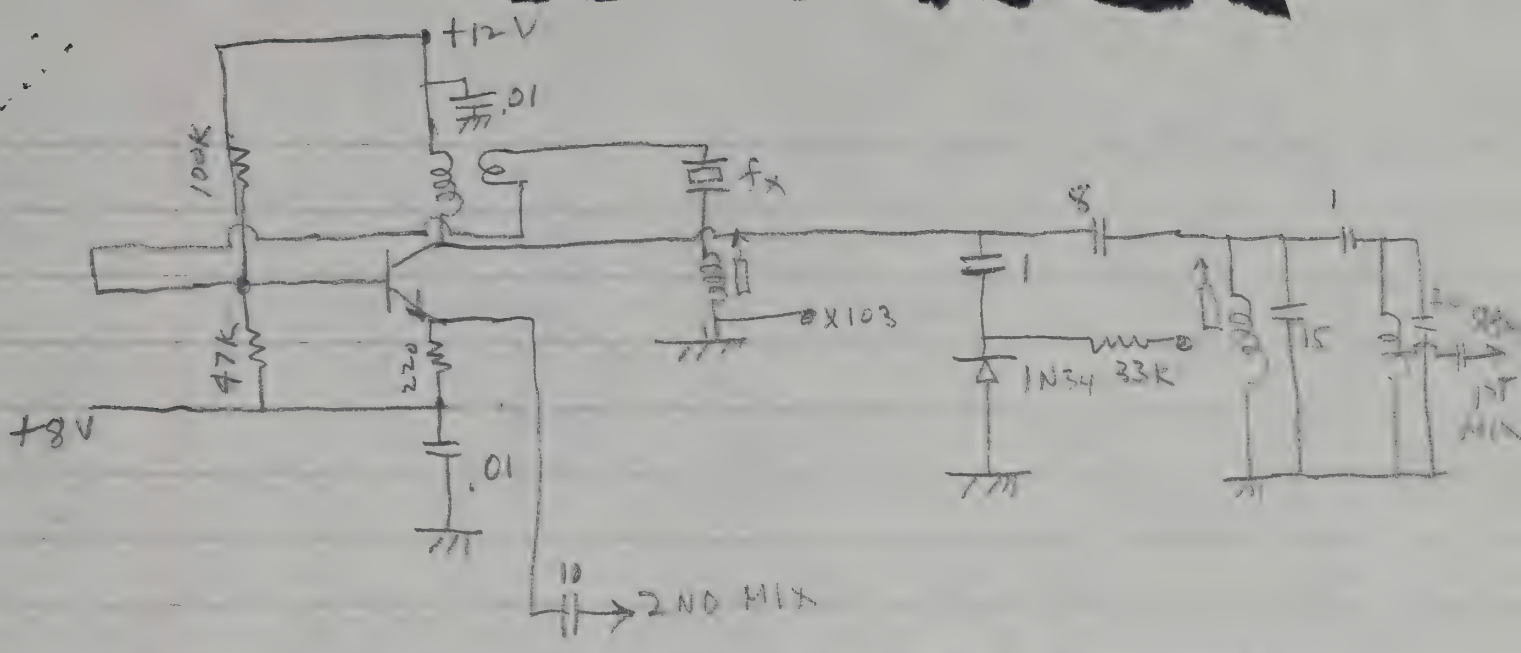
RF STAGE UP TO MIXER BASE

Mixer efficiency assumed to be high (1.00) in mixing small (15 uV) test signal (152.545 Mc) with large amplitude oscillator (136. Mc and 200,000 uV.

Mixer efficiency assumed to be low (0.1) in mixing small (15 uV) test signal (152.545) with small (27 uV?) osc. 15th harmonic (170. Mc).

The poor efficiency of the mixer (0.1) attenuates the spurious signal voltage to 0.1, but the response curve favors the spurious signal by 35 db (56 times voltage).

The 10th harmonic must be attenuated $\frac{200,000 uV}{27 uV} = 77.$ db below the 8th harmonic. (This assumes 10% mixer efficiency in producing the undesired response).



$F_x = \frac{F_c - 455\,kc}{9} = \frac{-.455}{9} = -$ Mc = [ ]

Signal = Fcarrier = $9F_x + 455\,kc = 9(17)^{Mc} + .455 =$

Image Signal = Sig − 455 Kc

Undesired signal (10_{f_x}) − desired signal $(9_{f_x} + 455\,kc) = 153.$ Mc

170 Mc − $9(17) + .455 =$

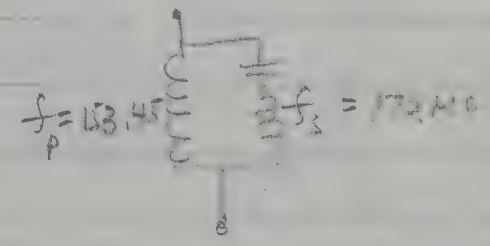
170 Mc − 153.455 = 16.545 Mc

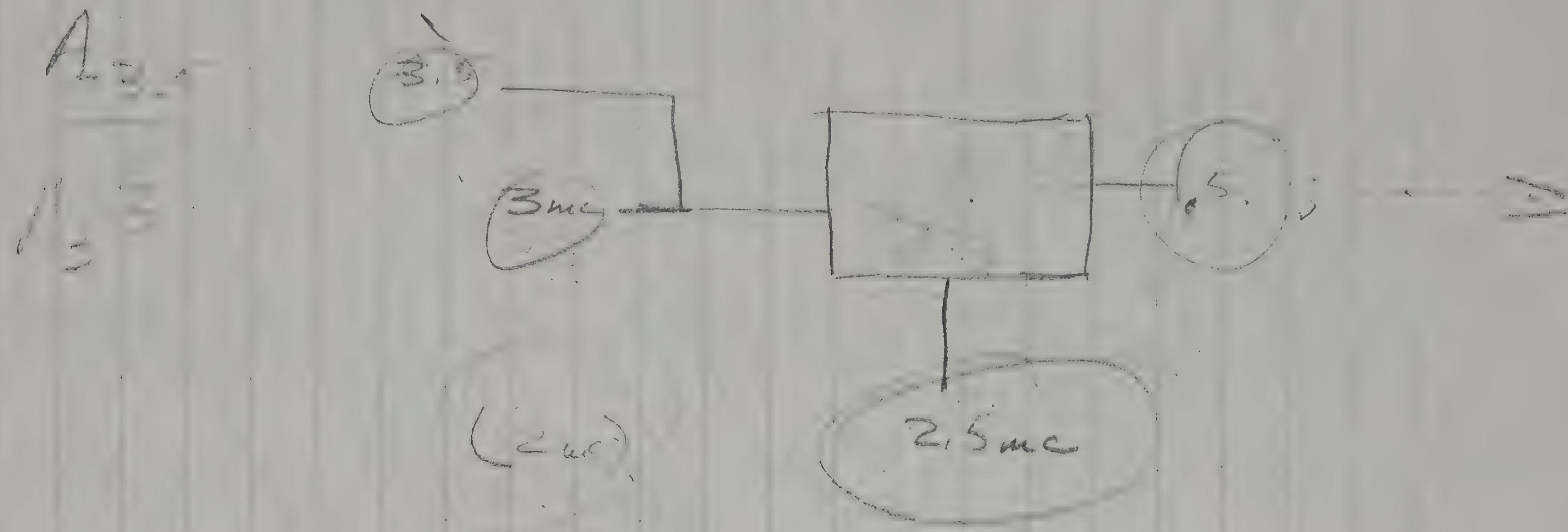
desired sig = 153.455

undesired sig = 170 Mc

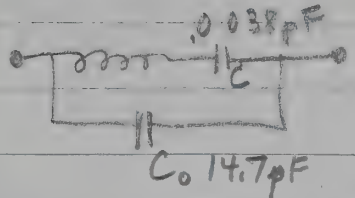
diff = 16.545 Mc

$\frac{f_u}{f_{desired}} = \frac{170}{153.} =$ 1.11



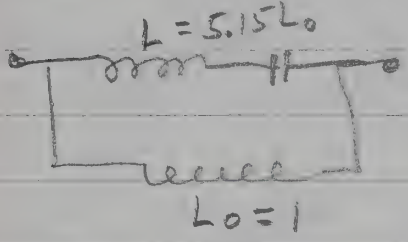

3mc
(2mc)
2.5mc

Crystal resonance, 10/18/



$f_s = 5,502$ kc $\qquad \frac{C}{C_o} = .000258$

$$\text{freq spacing} = \frac{f_s}{2}\left(\frac{C}{C_o}\right) = \frac{5,502}{2} \times \frac{3.8}{14700.} = 0.711 \text{ kc}$$



$$\text{freq. spacing} = \frac{f_s}{2}\left(\frac{L_o}{L}\right)$$

$$L_o = \frac{\text{freq spacing}}{f_s} 2L = \frac{.711}{5,502} \times 2L = .000258\,L$$

$$L_o = \frac{16.5}{170.} \times 2L = 0.194\,L$$

$$L = 5.15\,L_o$$

Logic: assume series res freq = f_s reduce freq by 10%, making X_C increase 10% and X_L decrease 10%, a 20% difference, and seeming to be equivalent.

To reduce the 20% across X_L, an X_L of 20% must be provided.

Thus the ratio $\frac{L_o}{L} = 20\%$

Some possible responses of GSA receiver caused by oscillator harmonics mixing with signal.

10/30/66
E. McDADE

A = XTAL FUND.
B = 455 KC IF

	187,455	(11A+B)	170, (10A) [illegible]	17,455 (A+B) 0 dB	455 kc	
	187,455	(11A+B)	204, (12A)	16,545 (A−B) −40 dB	455 kc	
	186,545	(11A−B)	170 (10A) 30?	16,545 (A−B) −40	455 kc	
	186,545	(11A−B)	204, (12A)	17,455 (A+B) 0		
	170,455	(10A+B)	153 (9A) 15?	17,455 (A+B) 0		
	170,455	(10A+B)	187 (11A) 44?	16,545 A−B −40		
	169,545	(10A−B)	153 9A 15?	16,545 (A−B) −40		
	169,545	(10A−B) 6 dB	187 11A 45?	17,455 (A+B) 0		
CHANNEL FREQUENCY	153,455	(9A+B) 0 dB	136 (8A) 0 dB	17,455 (A+B) 0 dB	455 kc (A)	0 dB
	153,455	(9A+B) 0 dB	170 (10A) 30 dB	16,545 (A−B) 40 dB	455	−70
2ND IMAGE	152,545	(9A−B) 0 dB	136 (8A) 0 dB	16,545 (A−B) 40	455	−40
	152,545	(9A−B) 0 dB	170 (10A)	17,455 (A+B) 0 dB	455	
	136,455	(8A+B) 6 dB	119 (7A)	17,455 (A+B) 0 dB		
	136,455	(8A+B)	153 (9A)	16,545 (A−B)		
	135,545	(8A−B)	119 (7A)	16,545 (A−B)		
	135,545	(8A−B)	153 (9A)	17,455 (A+B) 0 dB		
	119,455	7A+B	102 (6A)	17,455 (A+B) 0 dB		
	119,455	7A+B	136 (8A)	16,545 (A−B)		
1ST IMAGE	118,545	7A−B	102 (6A)	16,545 (A−B)		
	118,545	7A−B	136 (8A)	17,455 (A+B) 0 dB		

other modes:

1. 153,455 (9A+B) — 153 (9A) — hi IF Bypass → 455
2. 144,727 8A + (A+B)/2 — 136 (8A) — (A+B)/2 doubled → A+B → 455

another — The calculated attenuation will [illegible] the signal frequency is, for example:

	example	signal
(1) RF stage loss	−6 dB	(signal 0 dB)
(2) amplitude of osc harmonic over signal	+50	
(3) attenuation of osc harmonic	−30	
(4) conversion loss	−20 dB	(signal 0 dB)
(5) IF rejection	−40 dB	(signal 0 dB)
Total loss	−46 dB	(signal 0)

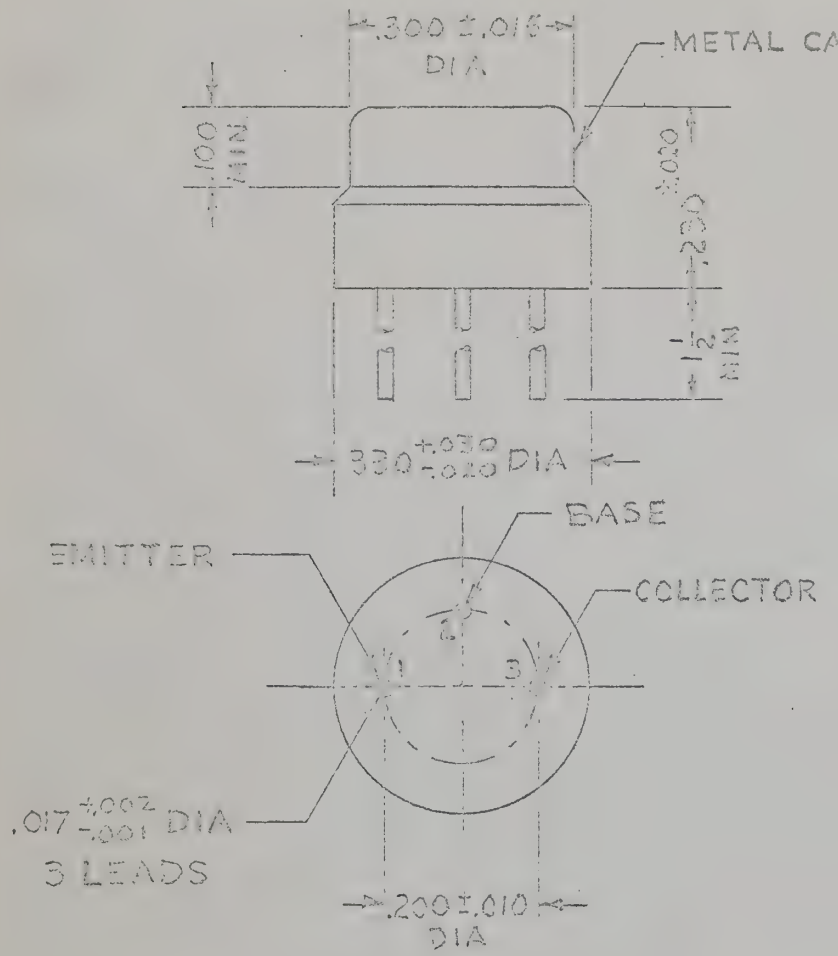
ALL DIMENSIONS IN INCHES DO NOT SCALE THIS DRAWING

HK-1B

NO. 4846-02-0000

HK-1B Keyer

REPLACES PT
K40774-1



2N404

CLASS OF SERVICE: LOW-LEVEL SWITCH

ELECTRICAL DATA:

MIN. DC COLLECTOR-TO-BASE VOLTS (FOR STATED DC COLLECTOR CURRENT μa): -25 @ Ic = -10 .

MAX. DC COLLECTOR CURRENT μa (FOR STATED DC COLLECTOR-TO-BASE VOLTS): -5 @ Vcb = -12 .

MAX. DC EMITTER CURRENT μa (FOR STATED DC EMITTER-TO-BASE VOLTS): -2.5 @ Veb = -1.5 .

MAXIMUM RATINGS: (ABSOLUTE VALUES)

DC COLLECTOR-TO-BASE VOLTS: -25

DC EMITTER-TO-BASE VOLTS: -12

DC COLLECTOR CURRENT MA: -100

DC EMITTER CURRENT MA: 100 .

COLLECTOR DISSIPATION MW AT AMBIENT TEMP. OF 25°C: 120, 55°C: 35, 71°C: 10 .

AMBIENT STORAGE TEMP. °C: -65 TO +85.

TYPICAL OPERATION: (AMBIENT TEMP. = 25°)

CIRCUIT: COMMON-BASE, EMITTER-INPUT

DC COLLECTOR-TO-EMITTER VOLTS: -6

DC COLLECTOR CURRENT MA: -1

SUPPLIER: RADIO CORP. OF AMERICA, OR EQUAL

APP.				PART NO.	ITEM	DESCRIPTION	MAT.	FIN.

REVISIONS

	APPROVED	DWG NO.
0	—	K40774-1

TOLERANCES

FRACTIONS: ± ——

DECIMALS: ± ——

ANGLES: ± ——

UNLESS OTHERWISE SPECIFIED

SCALE ——

TITLE: TRANSISTOR, PNP

MATERIAL: ——

FINISH: ——

HAMMARLUND
NEW YORK

FIRST MADE FOR HK-1B

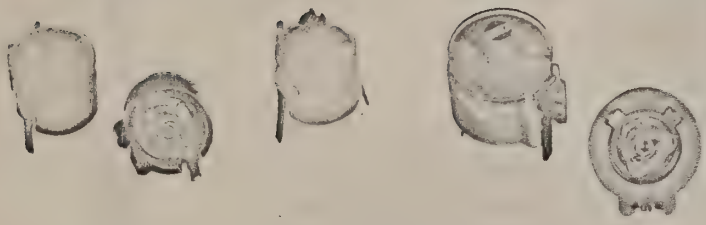
DRAWN D.T.

CHECKED

APPROVED

K

TENTATIVE DATA



RZ 20532-1

Range of capacitance swing 4.5 - 60 pF

GENERAL

This foil-dielectric trimmer has been designed to be used on printed-wiring boards in e.g. radio sets. Moreover, thanks to its good stability, the trimmer has proved its value in miniaturised industrial equipment.

The foil-dielectric trimmer C 010 is available in four capacitance values (see "TECHNICAL PERFORMANCE" and the figures 1 and 2).

CONSTRUCTION

The vanes are stacked on a sturdy plastic base. As a dielectric plastic foils are used, which support the vanes in such a way that a very good stability has been obtained.

Both ends of the rotor spindle are provided with a screwdriver slot to facilitate adjustment of the trimmer.

The connection pins are arranged so as to fit a grid of 0.1".

TECHNICAL PERFORMANCE

Type number	C 010 KA/5E	C 010 KA/10E	C 010 KA/20E	C 010 MA/60E
Cap. swing	>4.5 pF	>8.5 pF	>18.5 pF	>60 pF
Zero capacitance	<1.4 pF	≤1.5 pF	<2 pF	<5 pF
Par damping at 1.5 Mc/s and max. cap.	>10 MΩ	>10 MΩ	>5 MΩ	>3 MΩ
Temp. coefficient	-400 ± 350.10^{-6} pF/pF/deg C	-450 ± 500.10^{-6} pF/pF/deg C	-450 ± 250.10^{-6} pF/pF/deg C	-300 ± 100.10^{-6} pF/pF/deg C
Cap. change with an axial load of 200 g	<0.05 pF	<0.1 pF	<0.1 pF	<0.2 pF
Operating torque	10 - 150 gcm	10 - 150 gcm	10 - 150 gcm	20 - 150 gcm
Weight	0.7 g	0.7 g	0.8 g	1.3 g
Colour of base	grey	white	green	white

Maximum permissible working voltage	50 V_{dc}
Test voltage during 1 min	300 V_{dc}
Insulation resistance	$>10^4$ MΩ
Contact resistance	<10 mΩ
Permissible temperature range	- 40 to +70 °C
Solderability	260 °C, 3 s
Climatic category	according to IEC 68, test C, 21 days

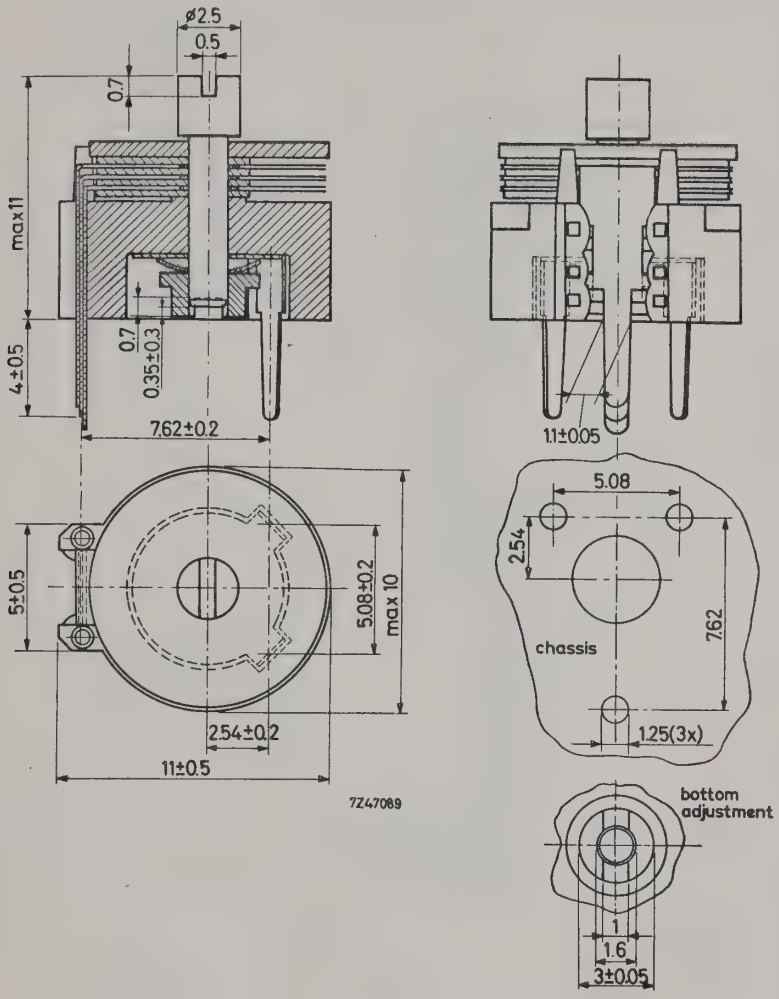


Fig. 1. Main dimensions in mm of the trimmer C 010MA/60E with mounting diagram

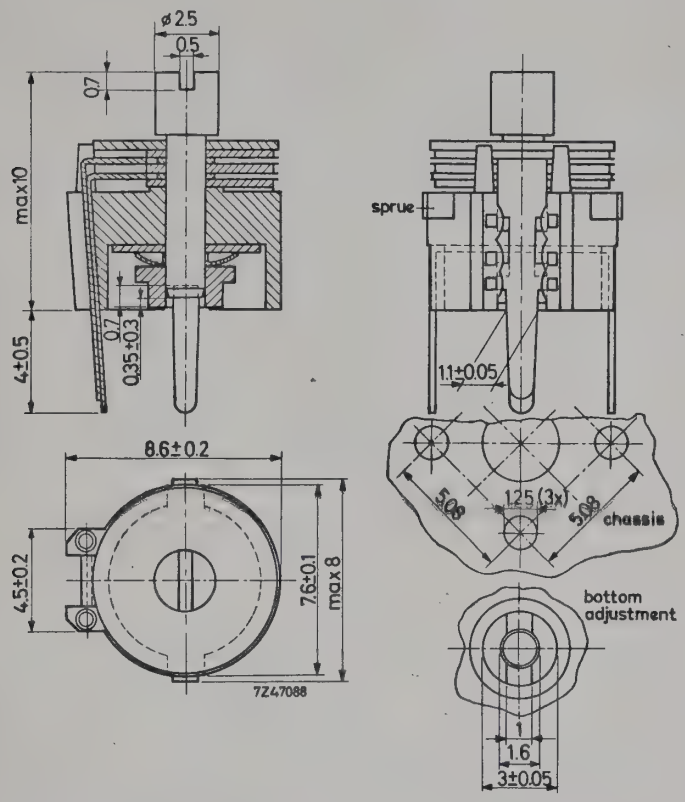


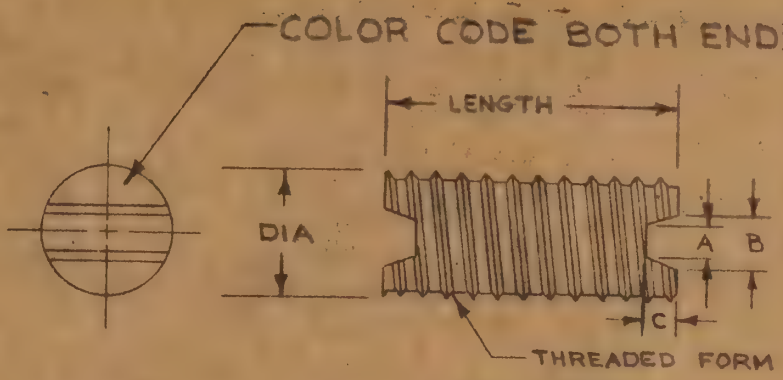
Fig. 2. Main dimensions in mm of the trimmers C 010 KA/5E, C 010 KA/10E and C 010 KA/20E with mounting diagram

Printed in Holland

32/279/B/E

ALL DIMENSIONS IN INCHES

NO. 1818-02-00004 THRU 00009



SLOT	A	B	C
D	.036	—	.036
J	.024	.032	.035
P	.022	.029	.032

FIGURE 1

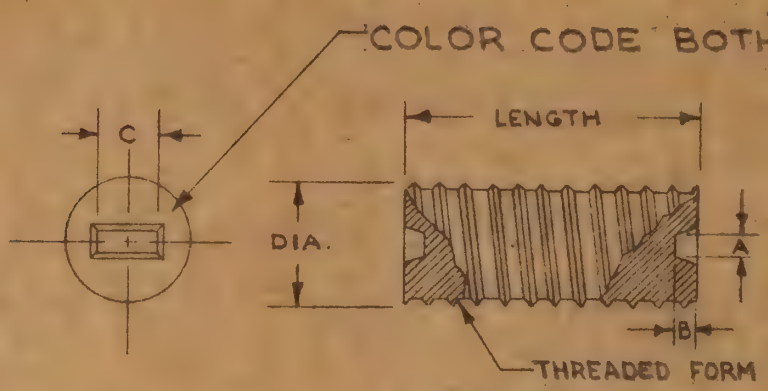
COLOR CODE	HAMMARLUND PART Nº
RED	-02-00004
BLACK	-02-00005
YELLOW	-02-00006
GREEN	-02-00007
WHITE	-02-00008
BLUE	-02-00009

NOTES:

1. * THIS NOMINAL DIMENSION VARIES WITH THE LENGTH OF THE CORE AND THE TYPE OF MATERIAL.
2. APPROVED SOURCE: MAGNETIC CORES INC./OR ARNOLD ENGINEERI MARENGO, ILLINOIS. EQUIVALENT SOURCE BY HAMMARLUND ENGINEERING APPROVAL ONLY. PART Nº: SEE TABLE
3. CORE SLOTS TO WITHSTAND TORQUE OF 8 IN. OZ. MIN. WITHOU BREAKING OR CRACKING OF CORE MATERIAL.

REVISIONS	APP.	
APPROVED		ADDED 7,8,9 (.003 OVERSIZE SLOT CODE MATERIAL TORQUE SPEC. 1-19-67 RS
0		-

DO NOT SCALE THIS DRAWING



SLOT	A	B	C
A	.052	.088	.105
K	.041	.052	.096
M	.024	.046	.064

FIGURE 2

PART Nº	FIG.	DIA.*	LENGTH	MATERIAL	THREAD FORM	SLOT TYPE	REMARKS
ARNOLD ENGR MAGNETIC CORES A-130	2	.130	.250	MAGNETIC CORES TYPE - SF	32-S	M	L101 - L106 L116 - L119 L125
FAIR-RITE	1	.130	.250	FAIR-RITE TYPE M	32-S	P	L111, L112
MAGNETIC CORES	2	.130	.312	MAGNETIC CORES TYPE SF	32-S	M	L107 - L110
MAGNETIC CORES	2	.133±.001	.250	MAGNETIC CORES TYPE SF	32-S	M	.003 OVERSIZE
FAIR-RITE	1	.133±.001	.250	FAIR-RITE TYPE M	32-S	P	.003 OVERSIZE
MAGNETIC CORES	2	.133±.001	.312	MAGNETIC CORES TYPE SF	32-S	M	.003 OVERSIZE

G CO.

			QTY.	PART NO.	ITEM	DESCRIPTION	MAT.	FIN.

TOLERANCES
FRACTIONS: ±
DECIMALS: ±
ANGLES: ±
UNLESS OTHERWISE SPECIFIED
SCALE None

TITLE: CORE, THREADED

MATERIAL:

FIRST MADE FOR HFM (GSA)
DRAWN XS
CHECKED
DATE 1-19-67

FINISH:

HAMMARLUND MFG. CO.
NEW YORK N.Y. — MARS HILL N.C.

No. 1818-02- 00004 THRU 00008

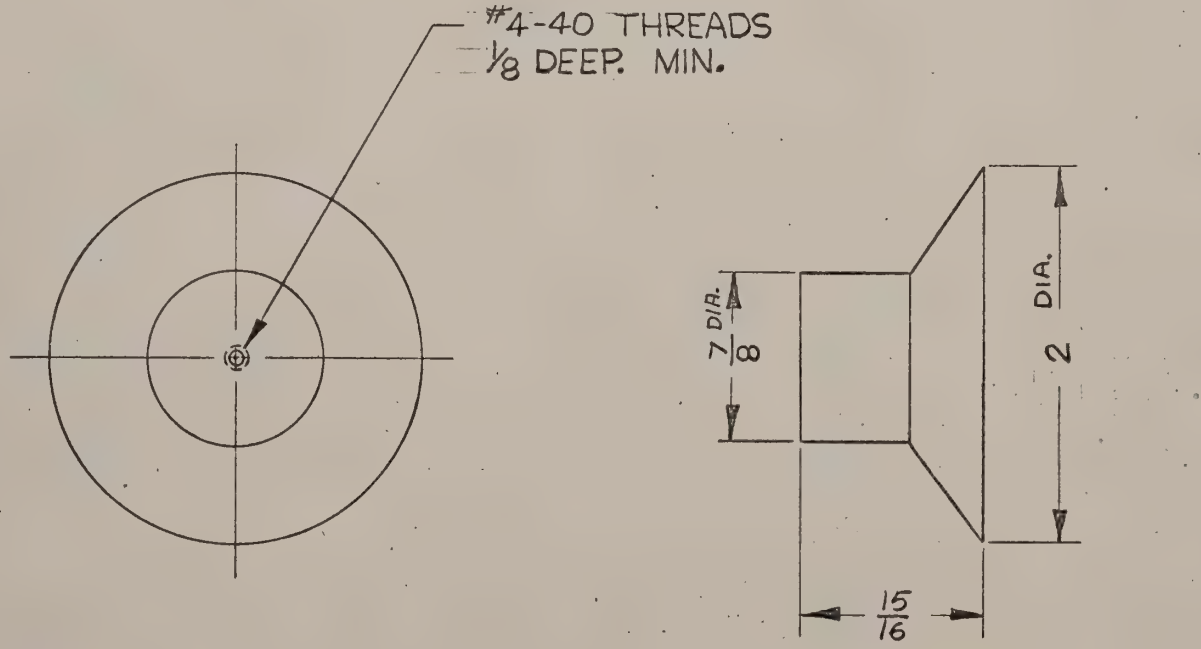
B

1818-02-00004-00009

ALL DIMENSIONS IN INCHES DO NOT SCALE THIS DRAWING

No. 1310-01-00014

10-16-67



TYPE : 2" ROUND
VOICE COIL : 32 Ω @ 1000 CP/S
MAGNET : .53 OZ.
RES. FREQ. : 490 CP/S @ 1 VOLT

APPROVED VENDOR :
OAKTRON
SAMPLE Nº 9482

APP.			PART NO.	ITEM	DESCRIPTION	MAT.	FIN.
REVISIONS	APPROVED 2-17-66						
	0						

TOLERANCES
FRACTIONS: ± ____
DECIMALS: ± ____
ANGLES: ° ± ____
UNLESS OTHERWISE SPECIFIED
SCALE ____

TITLE: SPEAKER
MATERIAL: ____
FINISH: ____
HAMMARLUND
NEW YORK

FIRST MADE FOR FM-1 GSA
DRAWN WLC
CHECKED
APPROVED

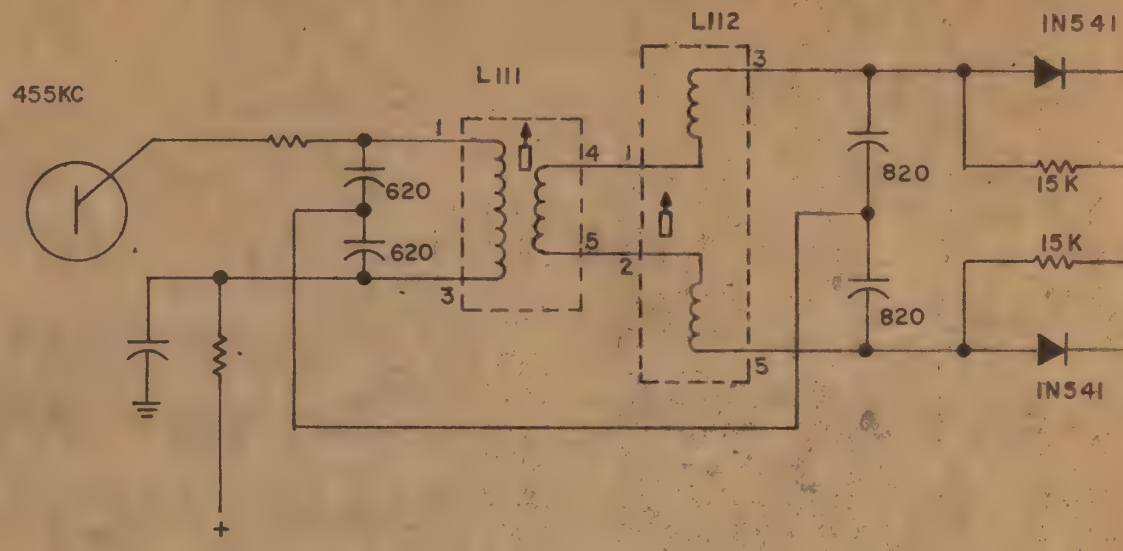
K

K-E ALBANENE 194L TRACING PAPER

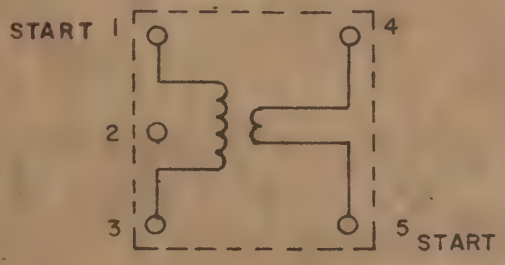
CARD

NO. 1813-01-00001
1813-01-00002

ALL DIMENSIONS IN INCHES

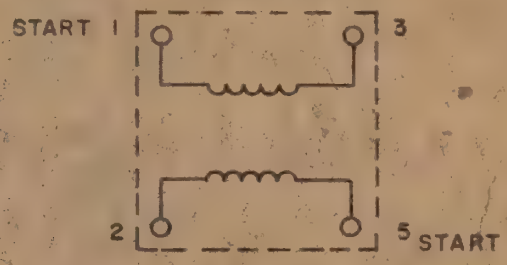


1813-01-00001
L111
UNDERVIEW



1-3 = 100 TURNS.
4-5 = 5 TURNS.

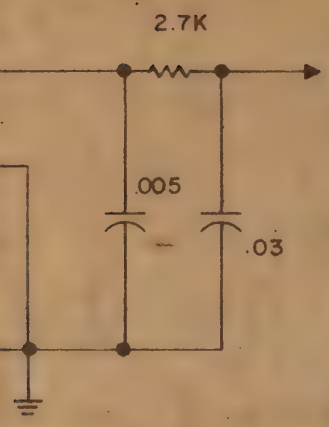
1813-01-00002
L112
UNDERVIEW

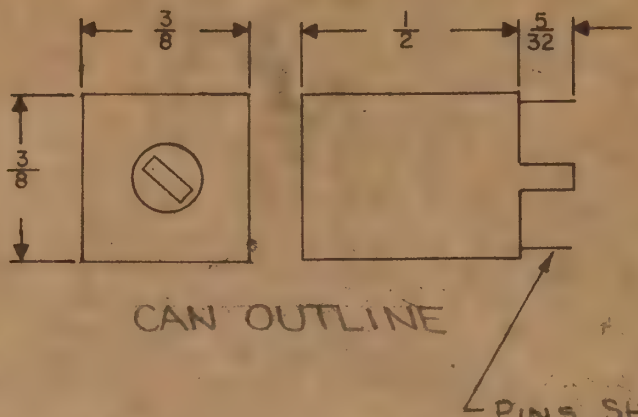


1-3 = 50 ½ TURNS.
2-5 = 50 ½ TURNS.

REVISIONS	APP.		
0	APPROVED MC		
1	DELETED PIN 4 FROM PART 1813-01-00002 3-8-66	MC	
2	ADDED NOTE 3 (11/4/66 MC)		

DO NOT SCALE THIS DRAWING





NOTES:
1. FUNGICIDAL TREATMENT REQUIRED.
2. 15 KC DEVIATION.
3. CORE: B1818-02-00005 (ARNOLD PT. NO. A1-286).

L111
SPECS: Q=135, D.C. RES. 10Ω MAX., PRIMARY TO SECONDARY TURNS RATIO 20:1
TEST PROCEDURE: RESONATE TO 450 KC WITH 350pf BETWEEN 1 & 3.

L112
SPECS: Q=125
TEST PROCEDURE: WITH 1 CONNECTED TO 2 & 300pf ACROSS 3&5, COIL WILL RESONATE AT 550 KC. 430pf ACROSS EACH COIL WILL RESONATE AT 900 KC

		QTY.	PART NO.	ITEM	DESCRIPTION	MAT.	FIN.

TOLERANCES
FRACTIONS: ±
DECIMALS: ±
ANGLES: ±
UNLESS OTHERWISE SPECIFIED
SCALE

TITLE: 455 KC DISCRIMINATOR XFMRS

MATERIAL:

FIRST MADE FOR HFM-1
DRAWN A K
CHECKED B Ballou C.
DATE 4-15-65

FINISH:

HAMMARLUND MFG. CO.
NEW YORK N.Y. — MARS HILL N.C.

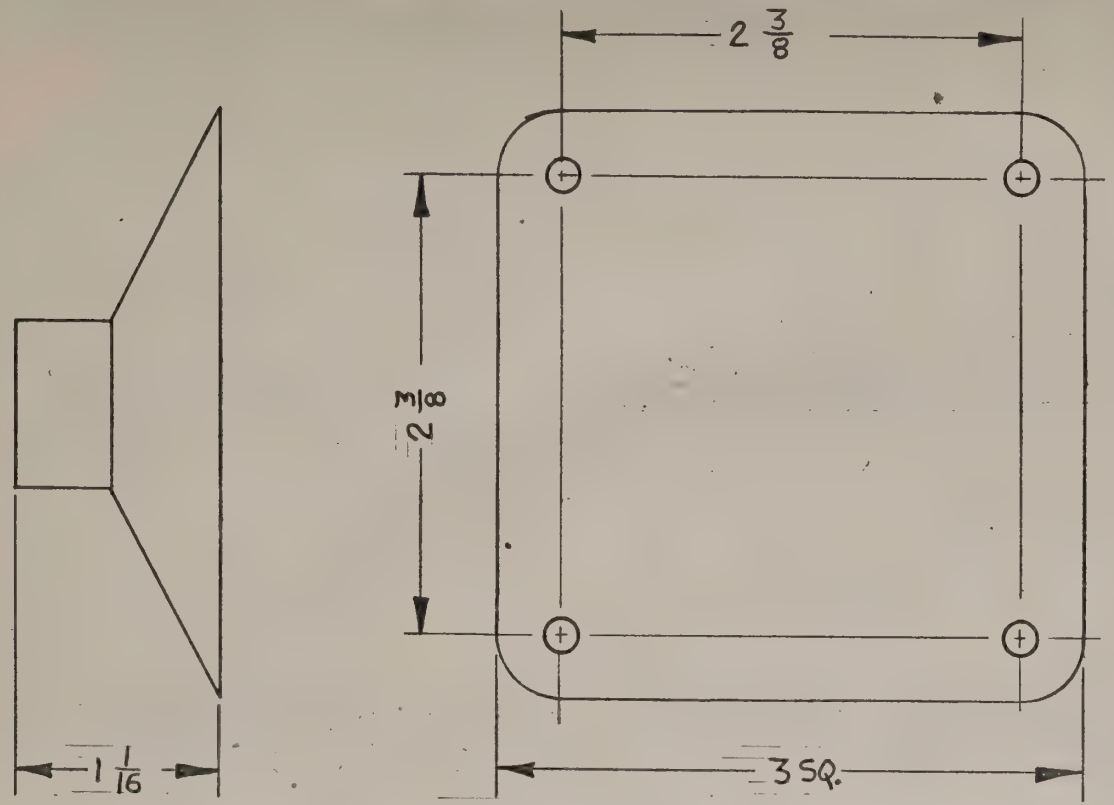
No. 1813-01-00001 00002

B

1813-01-00001-2

ALL DIMENSIONS IN INCHES DO NOT SCALE THIS DRAWING

No. 1310-01-00015



TYPE : 3" SQUARE
VOICE COIL : 32 Ω @ 1000 CP/S
MAGNET : .53 OZ.
RES. FREQ. : 340 CP/S @ 1 VOLT

APPROVED VENDOR :
OAKTRON
SAMPLE Nº S9497

APP.			PART NO.	ITEM	DESCRIPTION	MAT.	FIN.
REVISIONS							
O	APPROVED 2-17-66						

TOLERANCES
FRACTIONS: ± _____
DECIMALS: ± _____
ANGLES: ± _____
UNLESS OTHERWISE SPECIFIED
SCALE _____

TITLE: SPEAKER
MATERIAL: _____
FINISH: _____

HAMMARLUND
NEW YORK

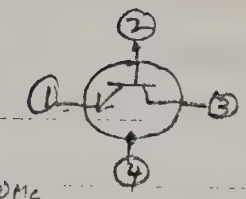
FIRST MADE FOR FM-5 GSA
DRAWN WLC
CHECKED
APPROVED

K

K-E ALBANENE 194L TRACING PAPER

CARD

HFM5



7-2 -67

Ft 900Mc, Unneut gain 11db 200Mc 15V hFE 9 at 200Mc

Q101	2N3478	silicon	RCA RF amp	K4857-1-1 9-64
Q102	2N3564	silicon	Fairchild HF mixer	K4858-1-1
Q105	2N3693	silicon	Fairchild	4857-1-2
Q113	2N3567	silicon	Fairchild	4859-1-1 Class A audio, class B push pull a
Q115	2N3638	silicon	Fairchild	class B audio
Q123	CS 2369	silicon	Continental Devices	doubler RF Tripler RF
Q126	2N3866	silicon	RCA (low) Power RF amp	6
Q505	2N1671	uni junction	GE	4840-01-00001 Case
Q506	C6U	silicon controlled rectifier	GE	4816 01 00001
Q1	2N301A		RCA Power	4857-01-00001 8/63
Q2	2N2152		Motorola Power	4852-01-00001
ZR1	VR15A		Sarkes Tarzian	K4833-01- 7
ZR2	VR9A		" "	K4833 01 6
Q127	40280		pwr amp RF	
Q301	40281		4 unit pwr amp RF	
	A*119		diode	
	1N34A		diode	
	TS4		diod (or regulator)	M4805-2-402 Diodes inc
	1N91		GE	4824-1-1

50V PNP Diss 30W 55°C Ic 10A IB 3A ICBO 0.5MA
Ft = 450Kc typ
HFE 50-165 Ic 1A
Diss 170W Ic 30A 45V ICBO 0.9MA at 45V Fae = 2.7Kc
HFE 50-100 at 5A

1 Watt out at 100Mc 20db gain
30V Sw diss Ic 0.4A

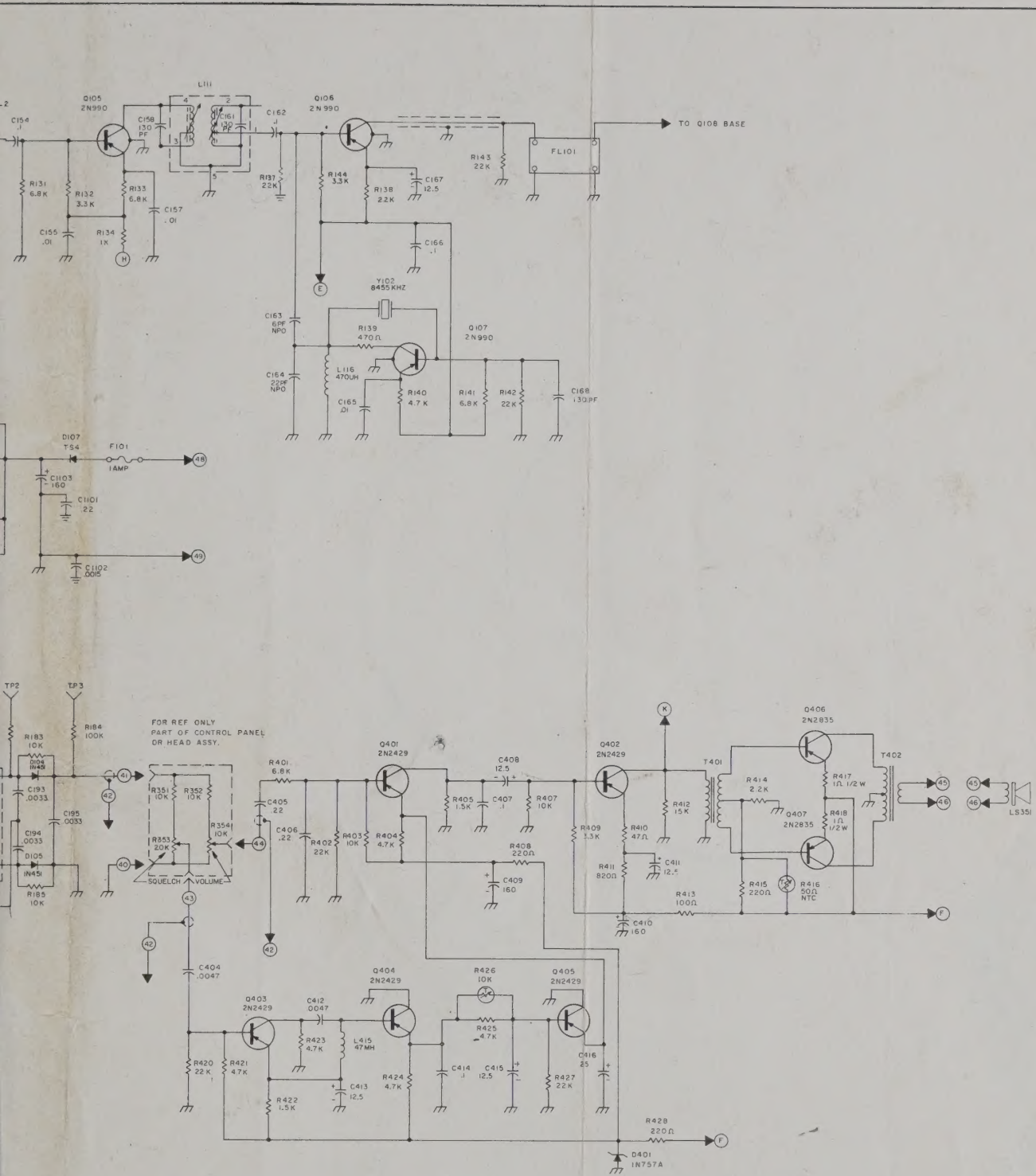
Ft 400Mc
10.7Mc 45V hFE 40-120
Ft 200Mc 32db
40V, hFE (40/120) Ic 150MA 50MA
60Mc at 50Ma, 300MW
25V, hFE 30 amp at 50MA 300MW
300MA Ft 100Mc 50MA
Switch, 15V 250MW hFE 40-120 10MA

hFE 5 min at 100Mc

250Mc 6db, 15V hFE 20 amp

K5627-1-10	L113	Choke 0.5Hy	audio driver
	L114	100Hy audio choke	
R1	4735-1-621	10K pot	screen divider
R2	4735-1-620	10K pot/w sw	
LS1	1210-1-14	8 ohm 32 oz	Oaktron
	4735-1-622	pot std size	

FL101 K2725-1-1 clavite filter ceramic TL3009-57A



NOTES:
1. ALL CAPACITORS ARE IN MFD UNLESS OTHERWISE SPECIFIED.
2. ALL RESISTORS ARE 1/4 W. UNLESS OTHERWISE SPECIFIED.
3. ⊓⊓ INDICATES FERRITE BEADS OVER WIRE.

HFM-30 Receiver

RECEIVER

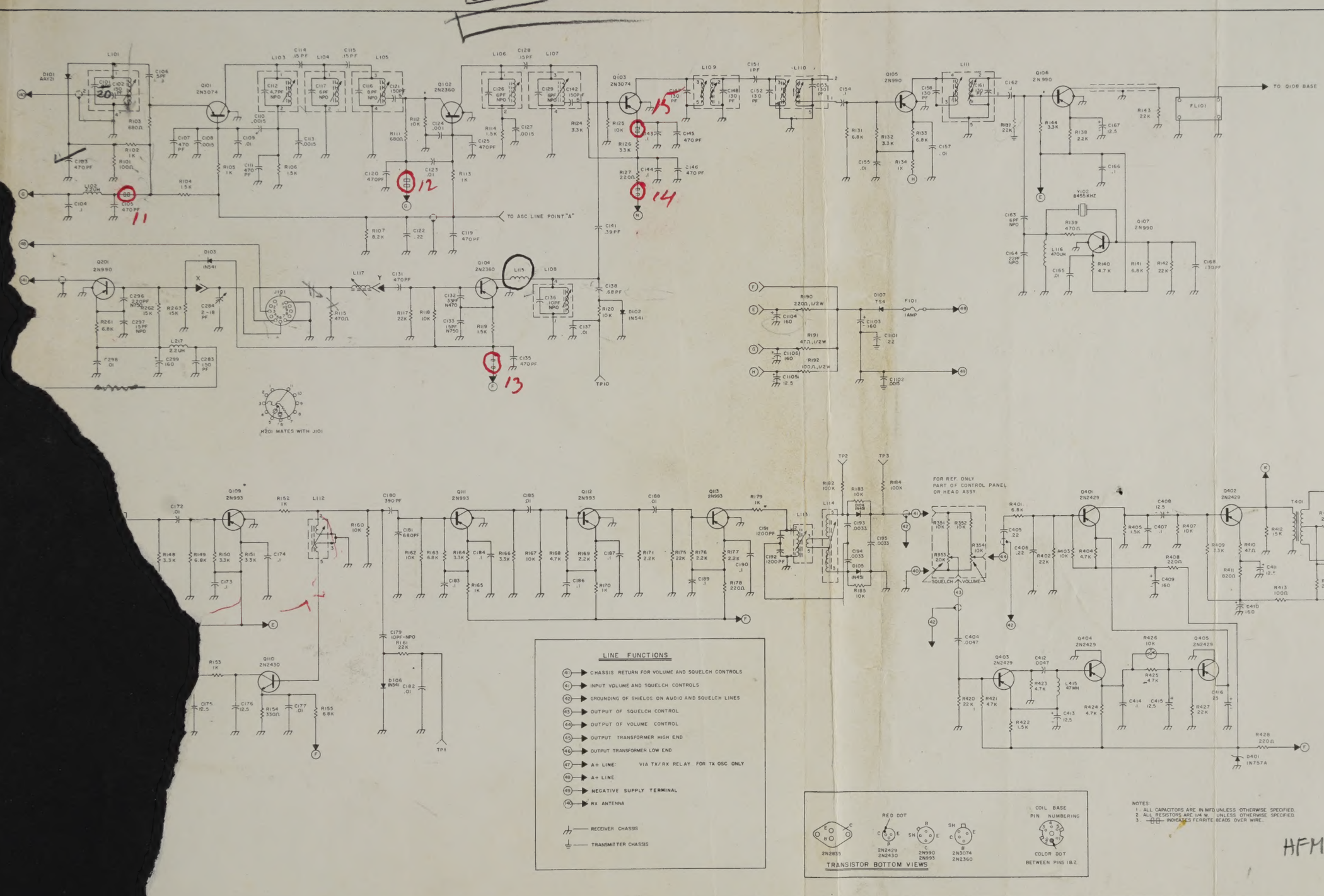
HFM-30
3-18-68

.5
5
2.5

150
5
750

750 PF

150



LINE FUNCTIONS

- (41) → CHASSIS RETURN FOR VOLUME AND SQUELCH CONTROLS
- (41) → INPUT VOLUME AND SQUELCH CONTROLS
- (42) → GROUNDING OF SHIELDS ON AUDIO AND SQUELCH LINES
- (43) → OUTPUT OF SQUELCH CONTROL
- (44) → OUTPUT OF VOLUME CONTROL
- (45) → OUTPUT TRANSFORMER HIGH END
- (46) → OUTPUT TRANSFORMER LOW END
- (47) → A+ LINE: VIA TX/RX RELAY FOR TX OSC ONLY
- (48) → A+ LINE
- (49) → NEGATIVE SUPPLY TERMINAL
- (40) → RX ANTENNA

—— RECEIVER CHASSIS

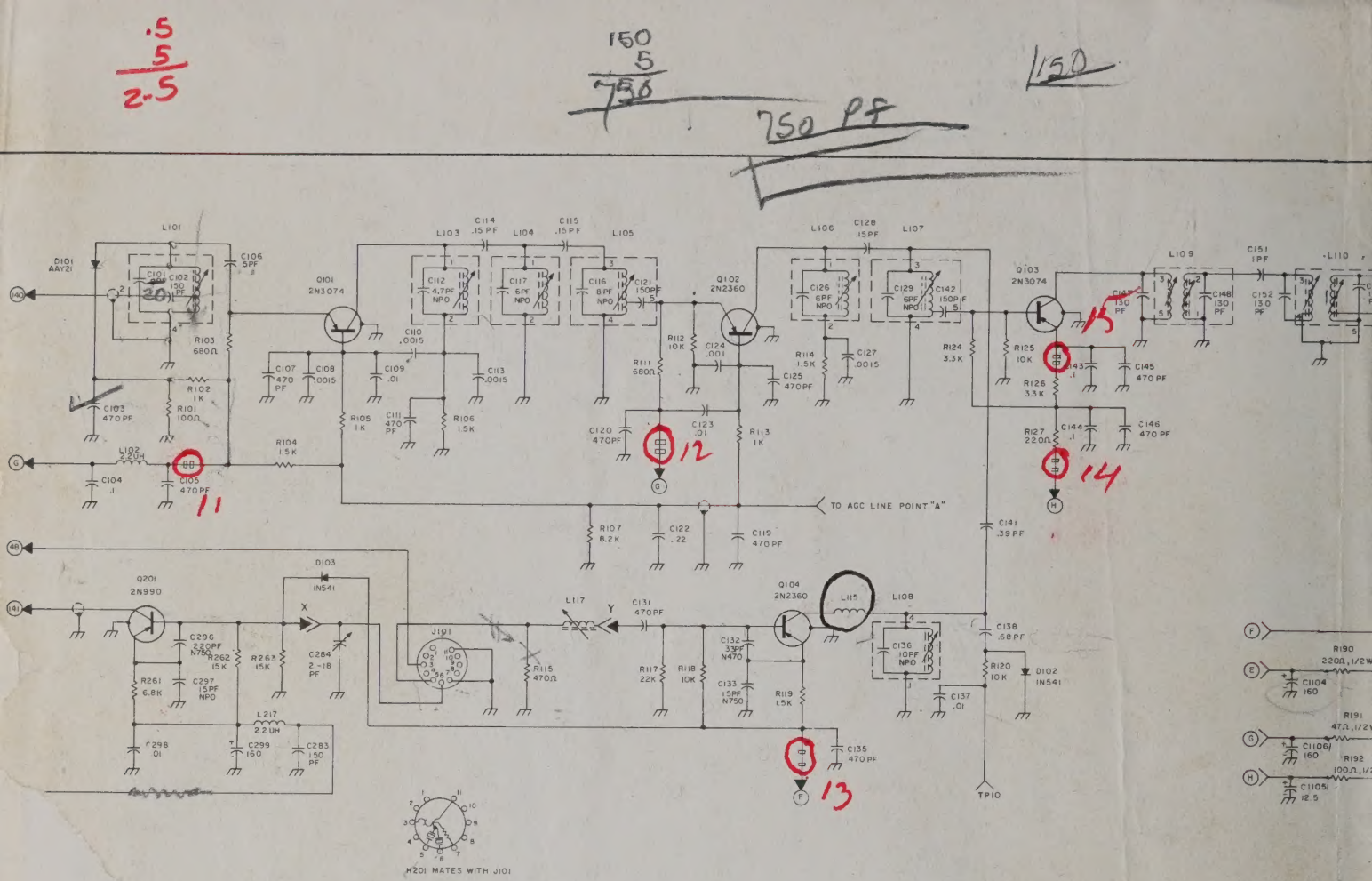
—— TRANSMITTER CHASSIS

NOTES:
1. ALL CAPACITORS ARE IN MFD UNLESS OTHERWISE SPECIFIED.
2. ALL RESISTORS ARE 1/4 W. UNLESS OTHERWISE SPECIFIED.
3. ⊓⊓ INDICATES FERRITE BEADS OVER WIRE.

HFM-30 Receiver

RECEIVER

HFM-30
3-18-68


D101 AAY21
L101
C106 5PF
Q101 2N3074
L103
C114 .15PF
L104
C115 .15PF
L105
C112 4.7PF NPO
C117 6PF NPO
C116 8PF NPO
C121 150PF 5
Q102 2N2360
L106
C128 15PF
L107
C126 6PF NPO
C129 6PF NPO
C142 150PF 5
Q103 2N3074
L109
C151 1PF
L110
C152 130 PF
C148 130 PF
C147 130 PF
C143 .1
C145 470 PF
C144 .1
C146 470 PF
R103 680Ω
R102 1K
R101 100Ω
C103 470 PF
L102 2.2UH
C104 .1
C105 470 PF
C107 470 PF
C108 .0015
C109 .01
C110 .0015
C113 .0015
C111 470 PF
R105 1K
R106 1.5K
R104 1.5K
R112 10K
R111 680Ω
C124 .001
C125 470PF
C120 470PF
C123 .01
R113 1K
R114 1.5K
C127 .0015
R124 3.3K
R125 10K
R126 3.3K
R127 220Ω
TO AGC LINE POINT "A"
R107 6.2K
C122 .22
C119 470 PF
C141 .39 PF
11
12
13
14
15
Q201 2N990
D103 IN541
C296 220PF N750
R262 15K
R263 15K
C284 2-18 PF
C297 15PF NPO
R261 6.8K
C298 .01
L217 2.2UH
C299 160
C283 150 PF
J101
R115 470Ω
L117
C131 470PF
Q104 2N2360
L115
L108
C132 33PF N470
C133 15PF N750
R117 22K
R118 10K
R119 1.5K
C135 470 PF
C136 10PF NPO
C137 .01
C138 .68 PF
R120 10K
D102 IN541
TP10
R190 220Ω,1/2W
C1104 160
R191 47Ω,1/2W
C1106 160
R192 100Ω,1/2W
C1105 12.5
H201 MATES WITH J101
Q109 2N993
C172 .01
R152 1K
L112
C180 390 PF
Q111 2N993
C185 .01
Q112 2N993
C188 .01
Q113 2N993
R179 1K
L113
C191 1200PF
C192 1200PF
C190 .1
R148 3.3K
R149 6.8K
R150 3.3K
R151 3.3K
C174 .1
C173 .1
R160 10K
C181 680PF
R162 10K
R163 6.8K
R164 3.3K
C184 .1
R166 3.3K
R167 10K
R168 4.7K
R169 2.2K
C187 .1
R171 2.2K
R175 22K
R176 2.2K
R177 2.2K
R178 220Ω
C183 .1
R165 1K
C186 .1
R170 1K
C189 .1
C179 10PF-NPO
R161 22K
D106 IN541
C182 .01
TP1
R153 1K
Q110 2N2430
C175 12.5
C176 12.5
R154 330Ω
C177 .01
R155 6.8K
LINE FUNCTIONS
41 CHASSIS RETURN FOR VOLUME AND SQUELCH CONTROLS
41 INPUT VOLUME AND SQUELCH CONTROLS
42 GROUNDING OF SHIELDS ON AUDIO AND SQUELCH LINES
43 OUTPUT OF SQUELCH CONTROL
44 OUTPUT OF VOLUME CONTROL
45 OUTPUT TRANSFORMER HIGH END
46 OUTPUT TRANSFORMER LOW END
47 A+ LINE VIA TX/RX RELAY FOR TX OSC ONLY
48 A+ LINE
49 NEGATIVE SUPPLY TERMINAL
140 RX ANTENNA
RECEIVER CHASSIS
TRANSMITTER CHASSIS